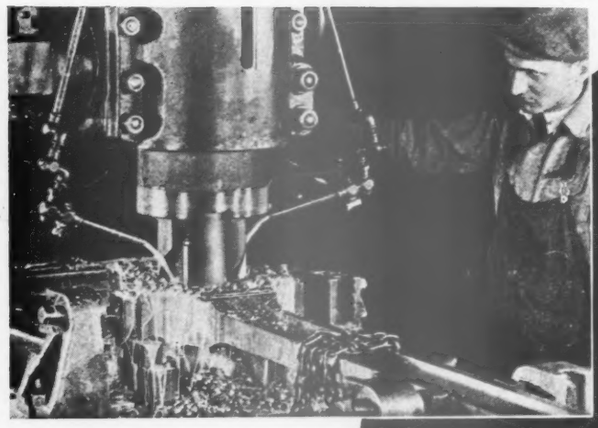
Railway Mechanical Engineer

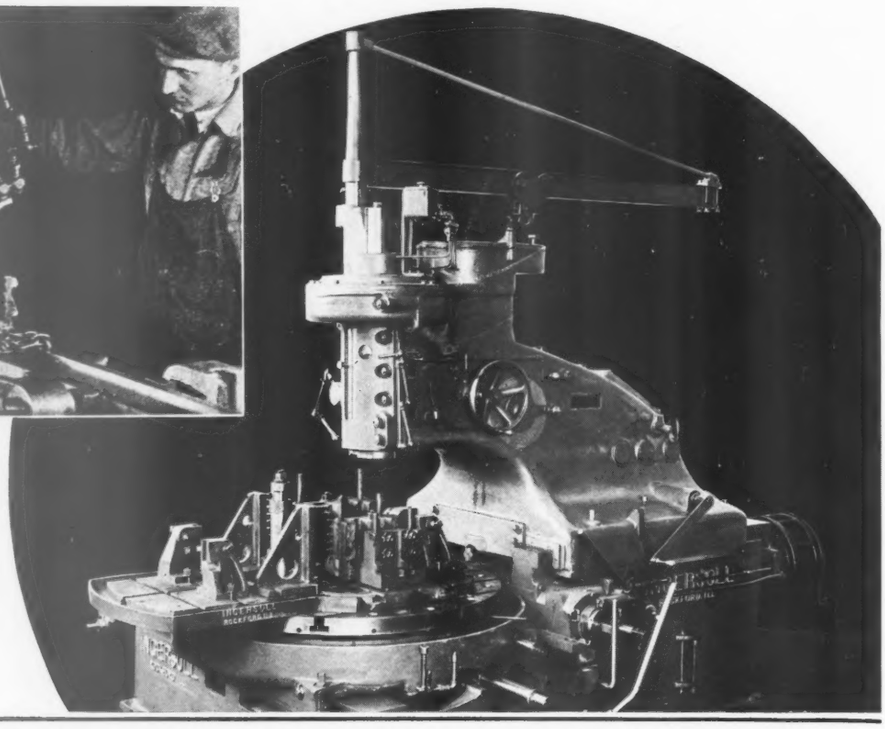
FOUNDED IN 1832

November 1930

35¢



Boring a 6¾" hole in a rod 3¾" thick using ¼" feed per minute.



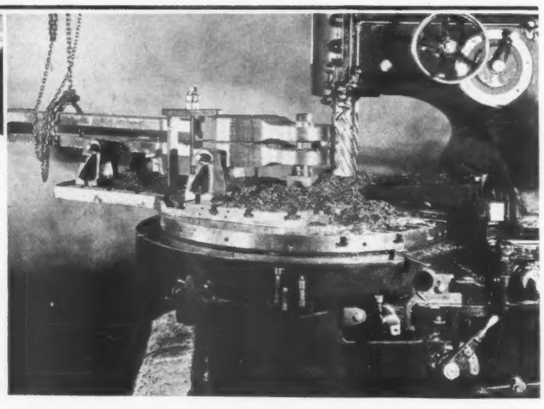
INGERSOLL ADJUSTABLE ROTARY

A Versatile Tool for Railroad Shops

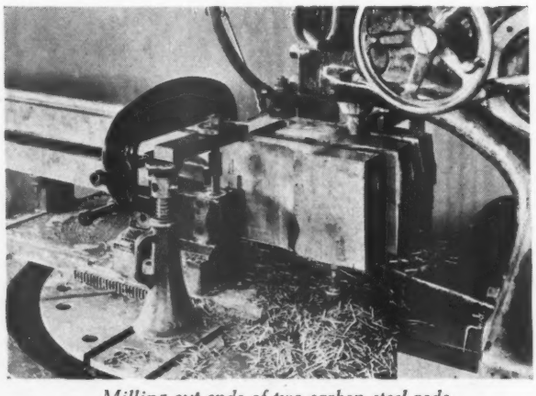
The Ingersoll Adjustable Rotary Milling Machine is earning its cost many times over in railroad shops throughout the country on operations such as rod ending, milling out jaws and tongues, trepanning, and contour milling. It is rugged and powerful enough for heavy accurate cuts in tough alloy steel rods, and its flexibility and ease of control allow for exceptionally low floor-to-floor time.

A wide variety of motions is made possible by a rotating table, mounted on a movable saddle, with the spindle housing sliding at right angles to it. These movements are controlled from the operator's station beside the table where he can perform any of the operations without losing sight of the work. This is especially important when following contour lines, or milling odd shaped pieces. Special Ingersoll fixtures are made for rod work and greatly reduce setup time on such operations.

Bulletin No. 46 "Ingersoll Equipment for Railroad Shops" describes the application of the machines we build for railroad work. Write for a copy.



Rounding off ends of two carbon steel rods using a feed of 4" per minute.



Milling out ends of two carbon steel rods using ¼" roughing and 1½" finishing feeds.

THE INGERSOLL MILLING MACHINE COMPANY » ROCKFORD, ILLINOIS, U. S. A.

Vol. 104 **Number 11**

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Editorial Contents for November, 1930

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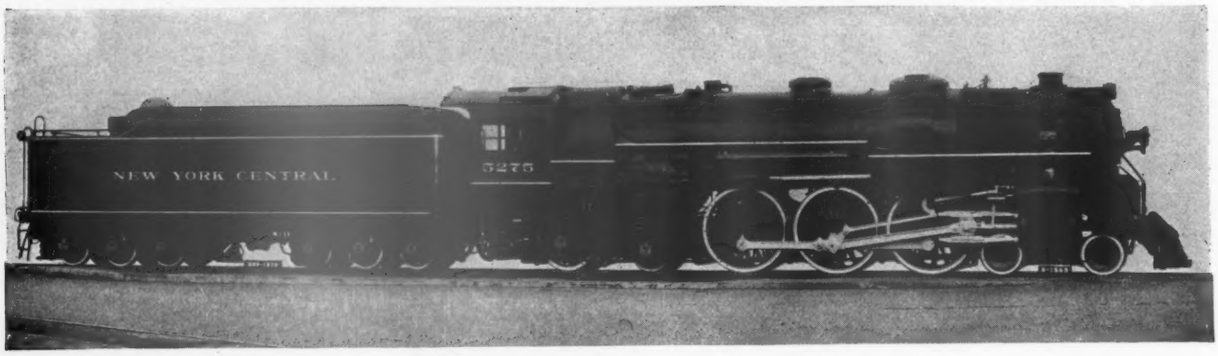
Timken-Equipped Engine Trucks On N.Y. Central Lines



The New York Central Lines now have 35 Timken Bearing Equipped locomotive engine trucks in service on their latest type locomotives.

They adopted Timken-equipped engine trucks as a result of successful service tests which extended over a year, signifying their approval and satisfaction by ordering 33 trucks immediately following the conclusion of the test period.

To the New York Central and to every other road which adopts them, Timken Bearing Equipped engine trucks mean substantial locomotive operating and maintenance savings with reliability of service. As center plate loads and locomotive speeds increase, these advantages will assume still greater importance—a fact to be considered when purchasing new motive power.

THE TIMKEN ROLLER BEARING CO.
C A N T O N, O H I O

TIMKEN *Tapered Roller* **BEARINGS**

Railway
Mechanical Engineer

Founded in 1832 as the American Rail-Road Journal

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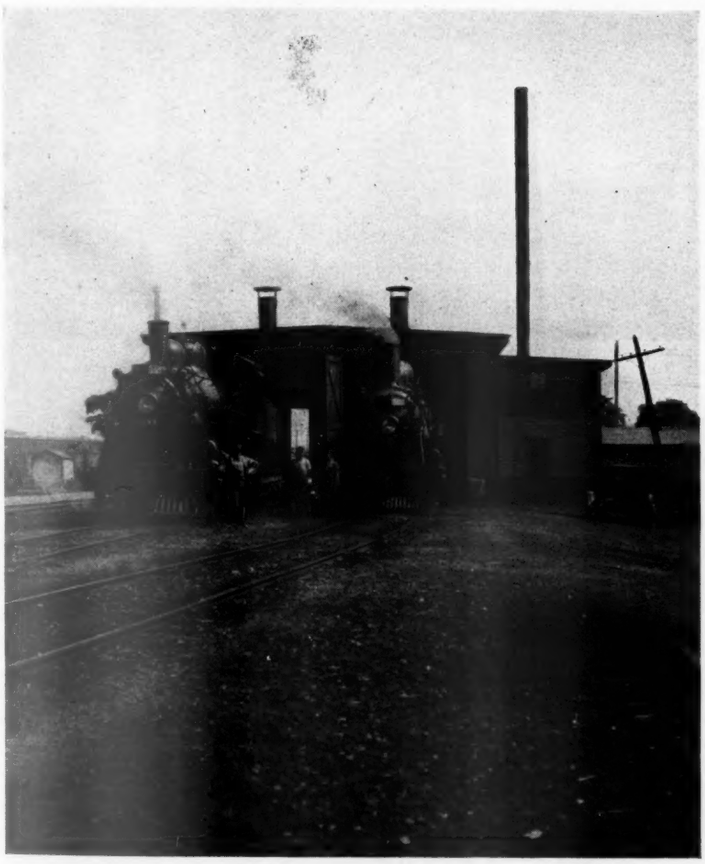


A branch-line enginehouse on the Grand Trunk Western at Bay City, Mich.

A One-Man Engine Terminal

Grand Trunk operates modern facilities at Bay City, Mich.

ABOUT five years ago it became necessary for the Grand Trunk Western to provide new enginehouse facilities at Bay City, Mich., due to the inadequacy of the old facilities which had served for a number of years. The problem involved in considering the new enginehouse was somewhat unusual inasmuch as it was desired to provide modern facilities to handle a small number of locomotives with the knowledge that in all probability the number would not greatly increase in the future. It was also desirable to provide a terminal that could be operated with the greatest economy with the least investment.

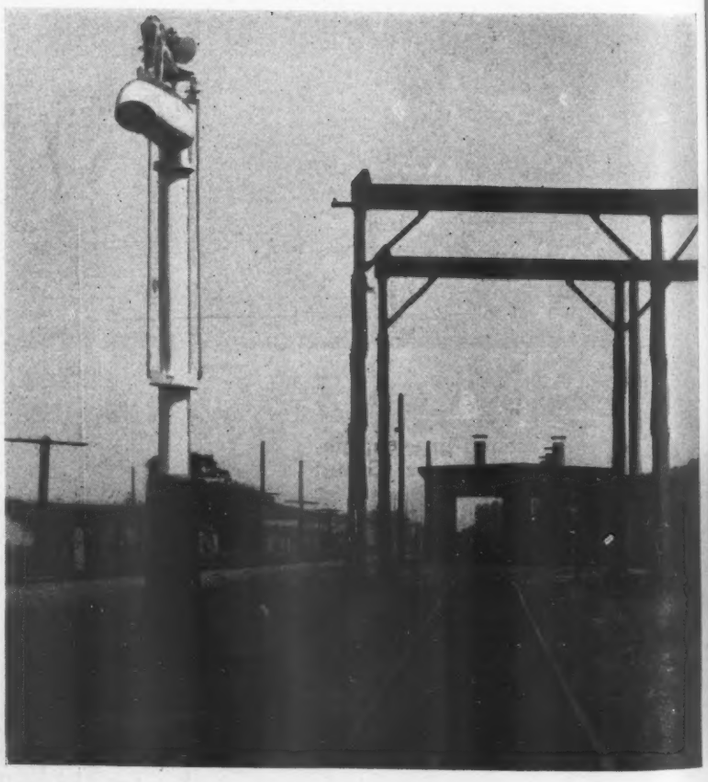
The locomotives handled at the Bay City terminal are all of

Above: The coal pit in the foreground with the locomotive set over the ash pit

Below: Looking down the lead track toward the ash pit, showing the overhead crane

the older type of power used entirely in local service between Bay City and Durand, Mich., a distance of 53 miles. At the present time there are four engines assigned to the terminal and when traffic is normal there are usually two or three more each day. The despatching schedule under present conditions calls for one engine to go out at 5:50 a. m. on a local freight every other day and this returns late in the evening and lays in over night. There is a yard engine marked out each week day at 7:30 a. m. This is back in the house again at night. A local passenger train leaving at 11:45 a. m. for Durand requires another locomotive which returns to Bay City again at 5:30 p. m. and lays in the house over night. A manifest freight train leaving Bay City at 5:30 p. m. necessitates the despatching of another engine which returns to the terminal the following morning. This line-up of power leaves one locomotive at the enginehouse during the day (after 10:30 a. m.) and two and three locomotives at night on alternate nights.

Inasmuch as all of the locomotives except the yard engine operate to Durand, where there is a larger enginehouse, the making of other than light repairs was not considered in building the Bay City enginehouse. Most of the repair work is of the lightest nature such as the



renewal of brake beams, etc. The heaviest repair job that is performed is the renewal of a driving spring. Under these circumstances the terminal was designed to be operated with a minimum labor force which now consists of one man on each shift during the summer months and two men on each shift during the winter months when there are coaches to be heated in addition to the locomotives requiring attention.

The work around a small terminal usually requiring the greatest expenditure of manual labor is the coaling of locomotives, the cleaning of fires and handling the ashes for disposal. This problem at the Bay City enginehouse was solved by the erection of an overhead crane with a one-yard clam-shell bucket. The crane runway has a total length of 61 ft. and extends over two tracks having 26-ft. centers. One track runs over a coal storage pit having an opening of 15 ft. by 16 ft. and a maximum depth of 8 ft. Under the track the pit has a 45-deg. slope so that the coal dumped from the hopper cars will clear readily. Alongside the car there is a clear coal pit opening of 9 ft. by 15 ft. from which the coal may be lifted by the clamshell and loaded on the locomotive tender on the adjoining track. The coal-storage pit has a nominal capacity of 90 tons.

The interior of the enginehouse

Under the track adjoining the coal-pit track there is a cinder pit 3 ft. 8½ in. wide by 50 ft. long with a depth of about 3 ft. 6 in. This cinder pit has sufficient capacity for several locomotives before it requires cleaning. An 18-ft. by 50-ft. space for the ground storage of cinders is also provided.

The span of the overhead crane is 50 ft. 0 in. and the runway length is 61 ft. The rails are 28 ft. above the top of the ground rails, providing a maximum bucket clearance of 17½ ft.

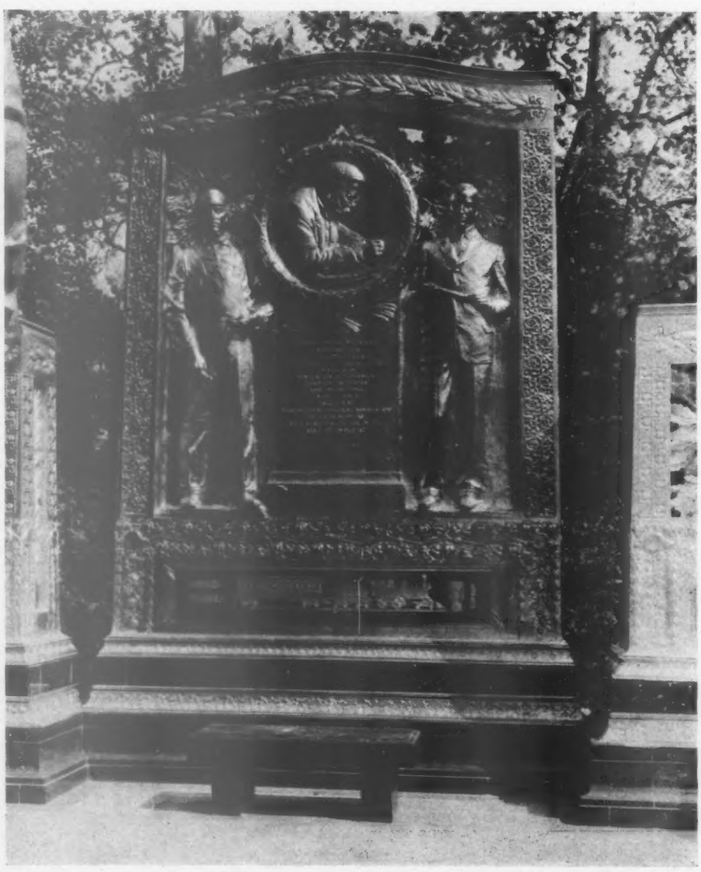
The enginehouse is a two-track longitudinal wood structure approximately 150 ft. long having storage capacity for four locomotives. Over each track there are three smoke jacks making it possible to accommodate locomotives regardless of the direction they may be headed, there being no turntable at the enginehouse. The house is also single-ended as far as the lead-in tracks are concerned although provision has been made for tracks at the opposite end. Both tracks in the house have steam-heated work pits practically the full length of the house. The house is also steam heated. Lighting is provided by reflector type lamps mounted on the columns and walls.

On the east side of the enginehouse there is a two-story lean-to 14 ft. by 80 ft. At one end is a 16-ft. office space and lavatory over which comfortable sleeping quarters have been provided for engine crews who may have to lay at that terminal over night. The remainder of the lean-to space is taken up, the full two-story-height, by the sand storage space, sand dryer, stationary boiler room and coal storage space. The boiler room is equipped with a 60-in. by 16-ft horizontal return-tubular boiler of 60 b. hp. which is used during the winter to heat the house and to provide steam for heating the coaches that are stored at the terminal.

George Westinghouse Memorial

Achievements of great inventor commemorated by group of figures and bas-reliefs in beautiful informal setting

ON October 6, in the mellow afternoon sunlight of an autumn day, in a wooded glen in Schenley Park, Pittsburgh, and in the presence of thousands of Westinghouse employees and guests, a beautiful and elaborate memorial was dedicated to the memory of the late George Westinghouse. Particularly appropriate, also, was the date—the eighty-fourth anniversary of Mr. Westinghouse's birth. He died on March 12, 1914. The memorial was erected and presented to the city of Pittsburgh by the George Westinghouse Memorial Association, composed of 54,251 members, mostly Westinghouse employees, with financial assistance from the Westinghouse Electric & Manufacturing Company and the Westinghouse Air Brake Company.



The central panel of the memorial

The memorial is not conventional. Rather does it portray in a simple and very concrete way the spirit and accomplishments of one of the greatest leaders in the field of modern invention and industry. Erected more than 16 years after the passing of Mr. Westinghouse, it is a measure, also, of the affection and high regard in which he was held by his fellows, not alone because of his achievements in engineering and industry, great as they were, but because of his keen appreciation of the importance of the human element in industry. The first to institute the half holiday on Saturday, he led also in recognizing in many ways what in these days industry generally is beginning to understand as square dealing and mutual co-operation with the employees.

The central panel of the memorial shows Mr. Westinghouse working over the drawing board in a characteristic pose familiar to those who were closely associated with him. On either side, supporting him as it were, are two figures, one representing the worker in the shop and the other the engineering associate and office worker. Alongside the central panel are two wings, each containing three panels, on which are pictured Mr. Westinghouse's outstanding achievements, with suitable inscriptions. These include, for instance, his first and most famous invention, the air brake; the railroad signaling system; alternating current railroad electrification; the remarkable achievement of illuminating the World's Fair at Chicago in 1893 by alternating current; the hydro-electric plant at Niagara Falls, with the 5,000-hp. alternating current generators; and the steam turbine introduced into America by Mr. Westinghouse and now widely used for electric generation by steam power.

Standing some distance from these panels and facing them is the figure of an American youth, in heroic size, with school books under his arm and cap doubled in his fist, gazing in eagerness and inspired by the scene before him. These pieces, all of gold-leafed bronze, rest on bases of jet black Norwegian granite, with the imbedded crystals of feldspar, which gleam blue as the rays of the sun strike them. The central panel and the American youth are the work on Daniel Chester French, possibly best known for his Lincoln Memorial statue in Washington. The bronze records of Westinghouse's six greatest achievements are the work of Paul Fjelde, a young Italian sculptor. The beautiful setting of the memorial was designed by Henry W. Hornbostel, who also designed the Harding Memorial.

The dedicatory ceremony was remarkable for its quiet impressiveness and dignity, in spite of the vast

assembly which was gathered in the glen and along the hillsides. This was due in no small measure to the thoroughness and completeness of the arrangements and the splendid judgment exercised in the musical program and its presentation by the Westinghouse Employees Band and the Westinghouse Employees Chorus. A. L. Humphrey, in a characteristic way, outlined the purpose of the program and read telegrams from President Hoover, Andrew J. Mellon, Secretary of the Treasury, and Thomas A. Edison. President Hoover, in expressing regret over his inability to attend, said, "I have high appreciation of the outstanding accomplishments of Mr. Westinghouse during his notable career. The inventions he created and the industrial institutions he established have been a most substantial contribution to our American life. Characters such as he well deserve to be honored by their contemporaries and their successors. You do well to commemorate his memory."

Mr. Humphrey then introduced E. M. Herr, vice-chairman of the board of directors of the Westinghouse Electric & Manufacturing Company, who acted as chairman.

The dedicatory address was made by Hon. James Francis Burke. In the course of the address he made these statements:

"Mr. Westinghouse was one of the most impressive figures and dynamic forces of his generation.

"Whether he was visualizing the future as he toiled in boyhood in his father's shop; whether fighting for his country in the Union cavalry or as an engineer in the naval forces of the Republic; whether he was perfecting his first invention to restore derailed cars to their tracks; whether he was mastering the difficulties he encountered while completing the air brake long since used on every continent; whether he was evolving his switch and signal system to protect rolling stock and human life from destruction, and save fabulous sums for the transportation companies of the world, the word failure never found a place in his lexicon.

"Whether he was developing the combustion engine or the steam turbine, to furnish a new force and a new volume of power to countless lines of industry; whether he was threading the highways of this great city with gas lines to supply her mills and factories and heat and light her homes with a comfort and safety never before equaled in the history of any city in the old world or the new; or whether he was developing the most far reaching and valuable of all his contributions to science—the alternating current system—he forced his critics to yield to the spirit of progress, saw archaic methods disappear and a new order on the way.

"Whether he was establishing great industrial institutions with branches in many parts of the globe, whose capital aggregated over $200,000,000, and whose activities gave employment to more than 80,000 men and women; or finally, whether he was traveling in triumph the highways of success or treading the Via Dolorosa that now and then has marked the journey of nearly every great character in history, George Westinghouse never wavered in his purpose or surrendered in his determination to enlarge and perpetuate the inventions and the institutions which he created as he journeyed down the years of an eventful life. * * * * * Set-backs seemed only to intensify his determination to attain his purpose and to conquer in the end, and the world is enriched as a consequence."

The memorial in its setting

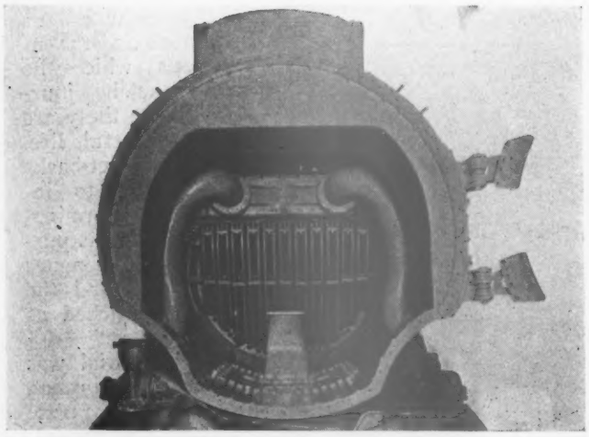
The memorial was unveiled by Herman Westinghouse Fletcher, a grandnephew of Mr. Westinghouse, and now a student at the University of Virginia. The presentation, in behalf of the Westinghouse employees and associates, was made by George Munro of the Westinghouse Veteran Employees' Association. Mayor Charles H. Kline received the memorial for the city.

The ceremonies for the day terminated with a dinner during the evening at the William Penn Hotel. A. L. Humphrey introduced the toastmaster, A. W. Robertson, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company. Addresses were made by Congressman James M. Beck of Philadelphia, former Solicitor General of the United States; by Rt. Hon. Lord Southborough, of England; and by John F. Miller, vice-president of the board of directors of the Westinghouse Air Brake Company.

Heavy 2-10-4 type locomotive built for the Chesapeake

Forty Heavy 2-10-4 Type

Purchased to replace older vice—Tractive for



The smokebox

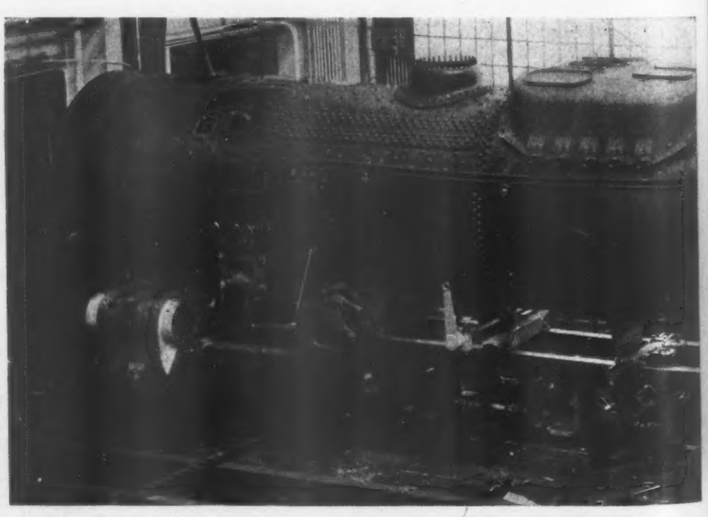
THE Lima Locomotive Works, Inc., has recently delivered forty 2-10-4 type locomotives to the Chesapeake & Ohio which are believed to be the largest and most powerful two-cylinder locomotives in the world. These locomotives, the first of which were completed in September, 1930, were purchased to replace older type locomotives in hauling coal and ore between Russell, Ky., and Toledo, Ohio. It is expected that the new power will effect a considerable reduction in maintenance and will handle increased tonnage with reduced pusher service.

Each of the new locomotives develops a rated tractive force of 91,584 lb. They are equipped with Franklin trailing-truck boosters, which gives each unit a rated tractive force at starting of 106,584 lb. The driving wheels are 69 in. in diameter and the boiler operates at a pressure of 260 lb. The cylinders are 29 in. in diameter by 34-in. stroke. The total weight of one of these engines is 566,000 lb., of which 373,000 lb. is carried on the drivers. The factor of adhesion is 4.07. The cylinders operate at a maximum cut-off of 80 per cent.

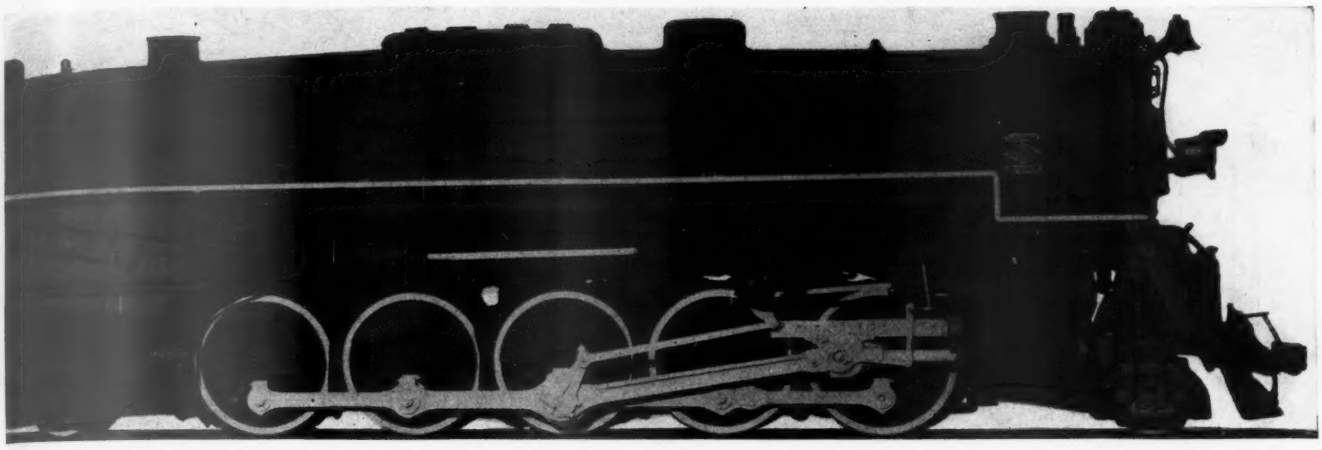
The large diameter driving wheels and long stroke permit maximum running speeds with minimum wear on the running gear.

Large Boiler and Firebox

The boiler is of the conical type, with three shell courses. The outside diameter of the first course is 97 15/16 in. and the outside diameter of the third course is 108 in. The shell courses are nickel steel, with felt strips for the seams made of the same material. There are 59 2¼-in. tubes and 275 3½-in. flues, and the distance over the tube sheets is 21 ft. The dome is located on the first course a short distance



Boiler assembled on the



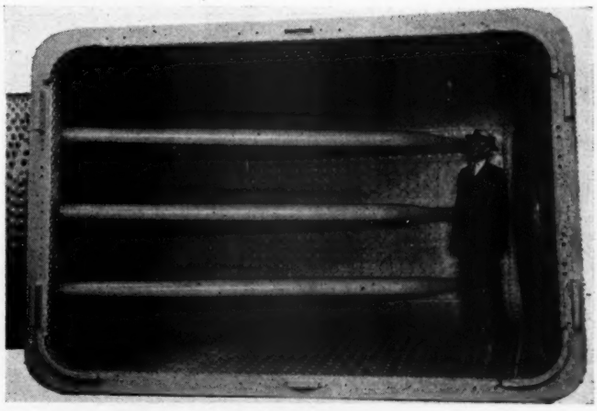
& Ohio by the Lima Locomotive Works, Inc.

Locomotives for the C. & O.

types in heavy freight ser-
ce of 91,584 lb.

back of the front flue sheet. Carbon-steel plate, 5/8-in. thick, is used in the smokebox. Recesses have been built into the smokebox to permit an application of the feedwater heater and its connections, free from the smokebox gases. After all the piping is applied, these recesses are neatly covered with plate, giving the front end a smooth appearance.

The general efficiency of the boiler is increased by the application of a Worthington Type S feedwater heater with a capacity of 12,000 gal. per hour, a Type E superheater, including a multiple throttle integral with the header, and three Nicholson Thermic Syphons in the firebox. The evaporative capacity is 113.1 per cent of the cylinder requirements, which easily provides sufficient steam for the cylinders and booster without forcing the boiler. Coal is fired with a modified Type B Standard stoker, the engine of which is carried on the tender. The grates are of the Firebar type and are arranged in three sections with two center frames.

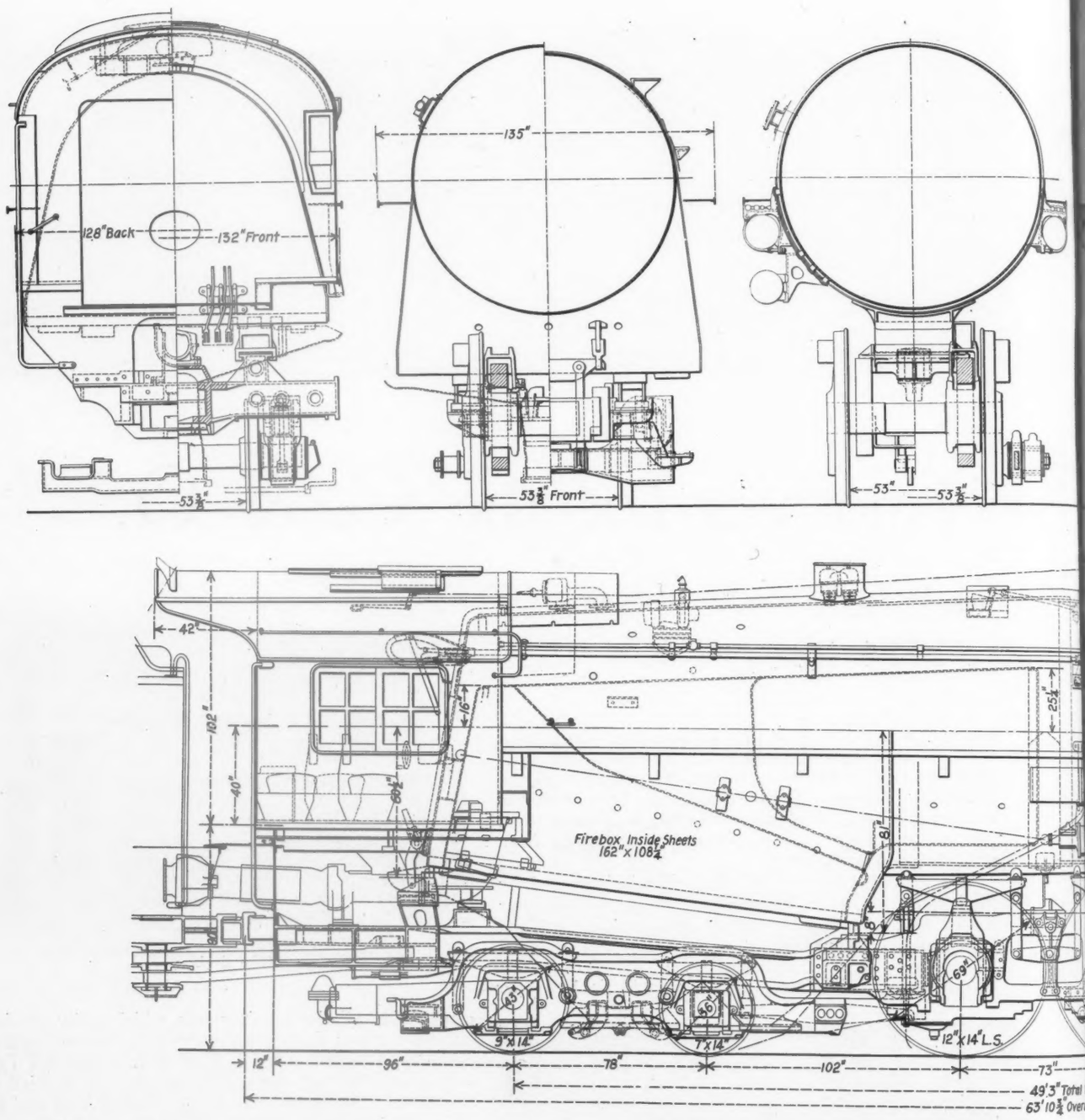


The firebox

frames in the erecting shop

The boiler is supported in the usual manner at the cylinders and is attached to the frame crossties by 3/4-in. waist sheets, which are bolted to cast-steel waist-sheet saddles. To distribute the load over as much of the boiler surface as possible, the wearing liners underneath the waist-sheet saddles are continued up to the horizontal center line of the boiler. The frame cradle supports the front and rear ends of the firebox by means of sliding furnace bearers bolted to lugs on the mud ring.

A single sandbox of 72-cu.-ft. capacity is located on the third course of the boiler and is equipped with five single sanders on each side. Sand is supplied in front of the No. 1 drivers, front and back of the main, back of the No. 5 drivers, and in front of the leading trailer wheels. With the exception of the booster, the only



Elevation and cross sections of the 2-10-4 type locomoti ilt by t

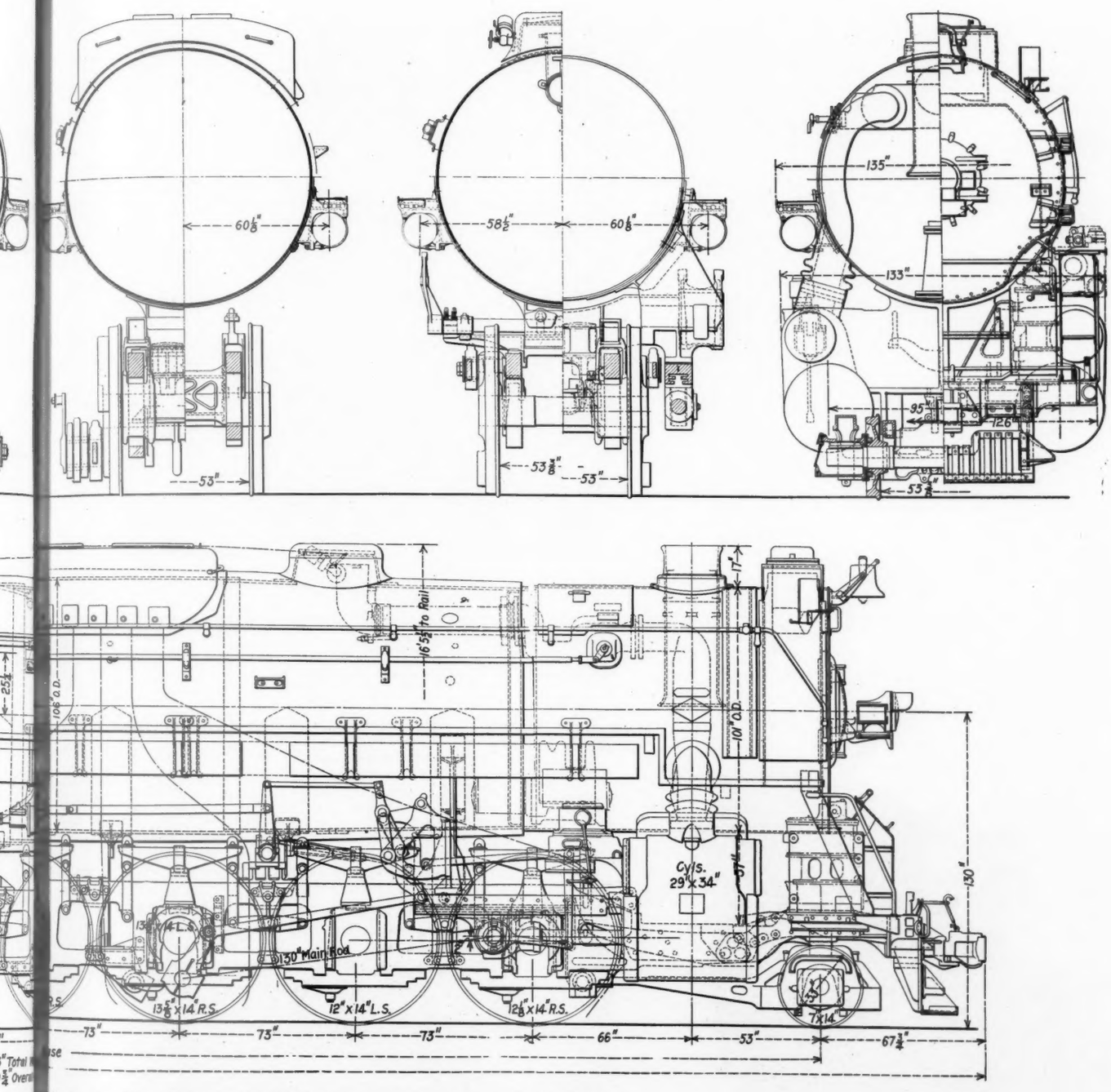
auxiliaries using superheated steam are the blower and the generator. The air compressors, stoker and the hot- and cold-water pumps of the feedwater heater are operated with saturated steam.

Firing rates at maximum horsepower are kept within an economical range by the extremely large firebox which has inside dimensions at the mud ring of 162 in. by 108¼ in., providing a grate area of 121.7 sq. ft. The combustion chamber is 66 in. long. The firebox heating surface is further increased by the application of three firebox syphons. There is a partial installation of Alco flexible staybolts in the firebox and a complete installation of flexible bolts in the combustion chamber.

Steam distribution is effected by a Baker valve gear of the long-travel type, the piston valves of which are 14 in. in diameter. Reversing is effected by means of a Precision Type F reverse gear.

Frames and Running Gear

Frames of nickel cast steel, braced with cast-steel crossties, provide a substantial chassis for carrying the power plant. A General Steel Casting's frame cradle is bolted to the frames in the usual manner. The cylinders are made of cast steel and have been designed with special care to obtain free and unrestricted steam flow. Two 8½-in. cross-compound air compressors are located ahead of the cylinders and are supported on brackets



ilt by the Lima Locomotive Works, Inc., for the Chesapeake & Ohio

cast integral with the front deck casting, illustrated.

The multi-faced type of crosshead and guide, with the Brewster crosshead wrist pin, have been applied, the guide being secured to the back cylinder head by the Alco "Slidguide" arrangement. Two feeds are installed from the mechanical lubricator to each guide.

The main rods are of the Franklin tandem, or articulated type, and the main and side rods are equipped with floating bronze bushings. A feature of the rod application consists in having the rod-bearing fit of the crank pins on the right side of the engine ⅛-in. larger in diameter than those on the left side. This makes it possible to rebore bearings which have been used on the left side and reapply them on the right side, thus prolonging the life of bearings and reducing maintenance.

Since these locomotives are required to pass over 17-deg. curves, it was found necessary to apply Franklin lateral-motion boxes on the front and back driving axles. These boxes permit lateral movement of ⅞ in. toward each side. The journals on the driving axles have been turned ⅛ in. larger in diameter on the right than on the left side of the engine, permitting the worn left-hand journal bearings to be rebored and used on the right-hand side. The nominal size of the main driving journal is 13½ in. by 14 in. Others are 12 in. by 14 in.

A General Steel Casting's outside-bearing-type engine truck, with 30 per cent initial and 25 per cent constant

resistance, is mounted on 7-in. by 14-in. journals and 33-in. wheels. The Delta four-wheel trailing truck has 36-in. wheels and 7-in. by 14-in. journals on the front axle and 43-in. wheels and 9-in. by 14-in. journals on the rear axle. The engine trucks on two of the locomotives are equipped with Timken roller bearings for test purposes. The remaining thirty-eight are built for the future application of roller bearings.

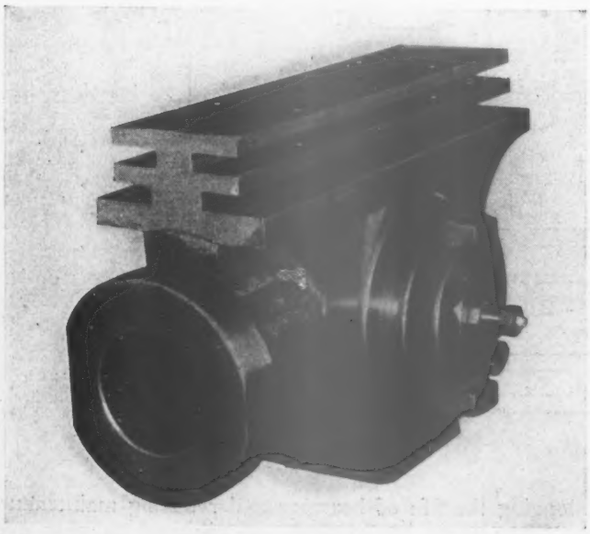
Locomotives Have Large Cabs

In designing the cab, considerable care was taken to obtain a cab of ample size and also to provide the most accessible arrangement of cab fittings for the enginemen. Seats are provided on the left side for the fireman and head brakeman and, in addition to the engineman's seat on the right side, there is a drop seat for an extra brakeman. There is an abundance of head-room in these cabs and all gages are easily visible. The backhead has been made unusually free from congestion by running the majority of the pipes underneath the jacket.

A Nathan 24-pint mechanical lubricator supplies the cylinders, steam chest, guides, engine trucks, air compressors and the hot-water pump of the feedwater

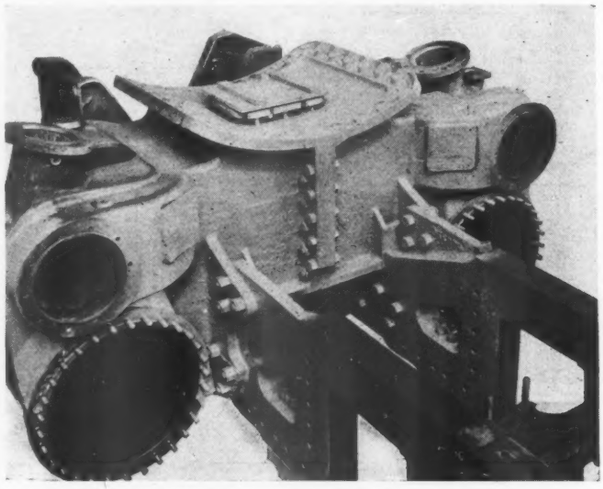
Principal dimensions, weights and proportions of the 2-10-4 type locomotives for the Chesapeake & Ohio

Railroad	Chesapeake & Ohio
Builder	Lima Locomotive Works
Type of locomotive	2-10-4
Service	Freight
Cylinders, diameter and stroke	29 in. by 34 in.
Valve gear, type	Baker
Valves, piston type, size	14 in.
Maximum travel	9 in.
Outside lap	1 1/16 in.
Exhaust clearance	Line and line
Lead in full gear	3/32 in.
Cut-off in full gear, per cent	80
Weights in working order:	
On drivers	373,000 lb.
On front truck	61,000 lb.
On trailing truck	132,000 lb.
Total engine	566,000 lb.
Tender	415,000 lb.
Total engine and tender	981,000 lb.
Wheel bases:	
Driving	24 ft. 4 in.
Total engine	49 ft. 3 in.
Total engine and tender	99 ft. 5 3/4 in.
Wheels, diameter outside tires:	
Driving	69 in.
Front truck	33 in.
Trailing truck, front	36 in.
Trailing truck, rear	43 in.
Journals, diameter and length:	
Driving, main, left side	13 1/2 in. by 14 in.
Driving, main, right side	13 5/8 in. by 14 in.



Nickel-steel crosshead

Driving, others, left side	12 in. by 14 in.
Driving, others, right side	12 1/4 in. by 14 in.
Front truck	7 in. by 14 in.
Trailing truck, front	7 in. by 14 in.
Trailing truck, rear	9 in. by. 14 in.
Boiler:	
Type	Conical
Steam pressure	260 lb.
Fuel, kind	Soft coal
Diameter, first ring, outside	99 3/4 in.
Firebox, length and width	162 in. by 108 1/4 in.
Combustion chamber length	66 in.
Tubes, number and diameter	59—2 1/4 in.
Flues, number and diameter	275—3 1/2 in.
Length over tube sheets	21 ft.
Grate area	121.7 sq. ft.
Heating surfaces:	
Firebox and combustion chamber	477 sq. ft.
Syphons	168 sq. ft.
Tubes and flues	5,990 sq. ft.
Total evaporative	6,635 sq. ft
Superheating	3,030 sq. ft.
Comb. superheat and evaporative	9,665 sq. ft.
Tender:	
Style	Rectangular
Water capacity	23,500 gal.
Fuel capacity	30 tons.

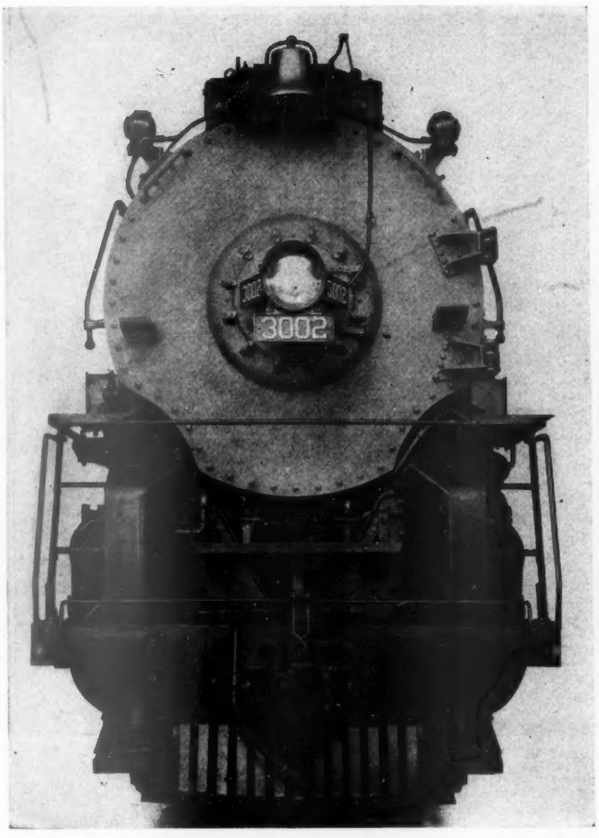


Cylinder castings with frames attached

Wheels, diameter outside tires	36 in.
Journals, diameter and length	7 in. by 14 in.
Rated tractive force	91,584 lb.
Rated tractive force, booster	15,000 lb.
Rated tractive force with booster	106,584 lb.
Weight proportions:	
Weight on drivers ÷ total weight engine, per cent	65.9
Weight on drivers ÷ tractive force	4.07
Total weight engine ÷ comb. heat, surface	58.5
Boiler proportions:	
Tractive force ÷ comb. heat. surface	9.5
Tractive force × dia. drivers ÷ comb. heat. surface	656
Firebox heat. surface ÷ grate area	5.30
Firebox heat. surface, per cent evap. heat. surface	9.73
Superheat. surface per cent evap. heat. surface	45.66
Comb. heat surface ÷ grate area	79.42

List of Special Equipment Applied on the Chesapeake & Ohio 2-10-4 Type Locomotives

Railroad	Chesapeake & Ohio
Builder	Lima Locomotive Works
No. ordered	40
Service	Freight
Boiler:	
Blow-off cocks	Okadee, type FHF
Boiler braces	Burden
Boiler braces	Old Dominion, Special Vibratory
Fire door	Franklin, butterfly
Firebox steel	Otis
Fire brick	American Arch
Grate bars	Firebar
Grate—Pin locks	Arpco
Injector checks	Nathan
Injector, right side	Nathan, non-lifting
Jacket, boiler	Armco



Front end of the C. & O. 2-10-4 type locomotives

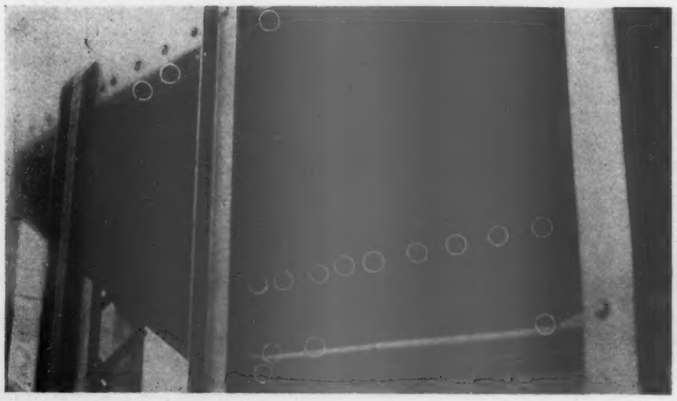
Plates, boiler-shell courses	Nickel steel
Rivets	Victor
Safety valves	Consolidated
Smokebox hinges	Okadee
Staybolts, Iron	Burden (15)
Staybolts, flexible	Alco, type Z
Staybolts, Iron	Ewald (15)
Staybolts, Iron	Ulster (5)
Staybolts, hollow	Bourne-Fuller nickel steel
Stavbolts, Iron	Falls Hollow (5)
Stays, radial crown and expansion	Alco flexible, type YA
Stoker	Standard, modified type B
Syphons (3)	Thermic
Throttle	American Multiple
Tubes	Pittsburgh Steel Products
Tubes	National Tube
Turret valves	Nathan, type NH
Washout plugs	Prime
Whistle	Nathan
Frames and running gear:	
Air compressors	Westinghouse, 8½ in. c c (20)
Air compressors	New York Air Brake (20)
Axle, driving, engine truck, and trailing truck	Carnegie Steel
Bearings, engine and trailing truck	National Bearings Metals Corp.
Booster	Franklin
Brake equipment	Westinghouse, ET-6 (20)
Brake equipment	New York Air Brake (20)
Bumper, front	Ohio
Cellars	Elvin Spreader type
Crosshead	Nickel steel
Crosshead key	Chrome-vanadium steel
Crosshead shoes	Hunt-Spiller
Crosstie, guide yoke	Nickel steel
Cylinders	Cast steel
Cylinder bushings	Hunt-Spiller
Cylinder casing	Armco
Cylinder cocks	Okadee, type CC-150
Cylinder cocks, operating valve	Okadee
Driver brake shoes	Diamond S
Driving boxes, front and rear	Franklin, lateral motion
Driving box, hub faces	National Bearings Metal Corp.
Driving box saddle	Moody
Engine truck bearings (2)	Timken
Engine truck frame	General Steel Castings
Frame, cradle	General Steel Castings
Frames, main	Nickel steel (Ohio)
Piston rod lubrication	O. & C.
Piston rod packing	M. B. Brewster
Power reverse gear	Precision, type F
Rings, valve, packing and bull	Hunt-Spiller
Rod bearings	National Bearings Metals Corp.
Sanders	Viloco
Shoes, Pedestal	Cast Steel
Steam chest bushings	Hunt-Spiller
Tires, driving	Railway Steel Spring
Truck, trailing	Delta
Wedges, Pedestal	Franklin, adjustable
Wheels, engine and trailing truck	Carnegie Steel
Cab:	
Back pressure gage	Ashton-Duplex
Gage cocks	Central (Perfection)
Seats	Van Dorn
Steam gage	Ashton
Water columns	Nathan, type WOA
Water gages	Okadee, type WG-112
Windows, storm and side	Prime
Miscellaneous:	
Air compressor, steam lubricator	Kirchoffer LL-105 (Edna Brass)
Ball joint unions	Corley-DeWolfe
Bell ringer	Viloco
Cocks and valves	Central Valve Mfg. Co.
Draw and safety bar, iron	Ewald
Drawbar, engine and tender	Unit Safety
Drawgear, engine	National Malleable & Steel Castings Co.
Electric wire	Okonite
Flexible joints	Barco
Grease cups	Prime
Headlight equipment	Pyle-National
Lubrication fittings	Alemite
Lubricators, force feed	Nathan DV-5
Pipe covering	Unarco

(Concluded on page 633)

Interior views showing the right and left sides of the cab

Powdered coal being loaded at bituminous mines—Cars must have tight bottoms and sides to prevent loss of loading while in transit

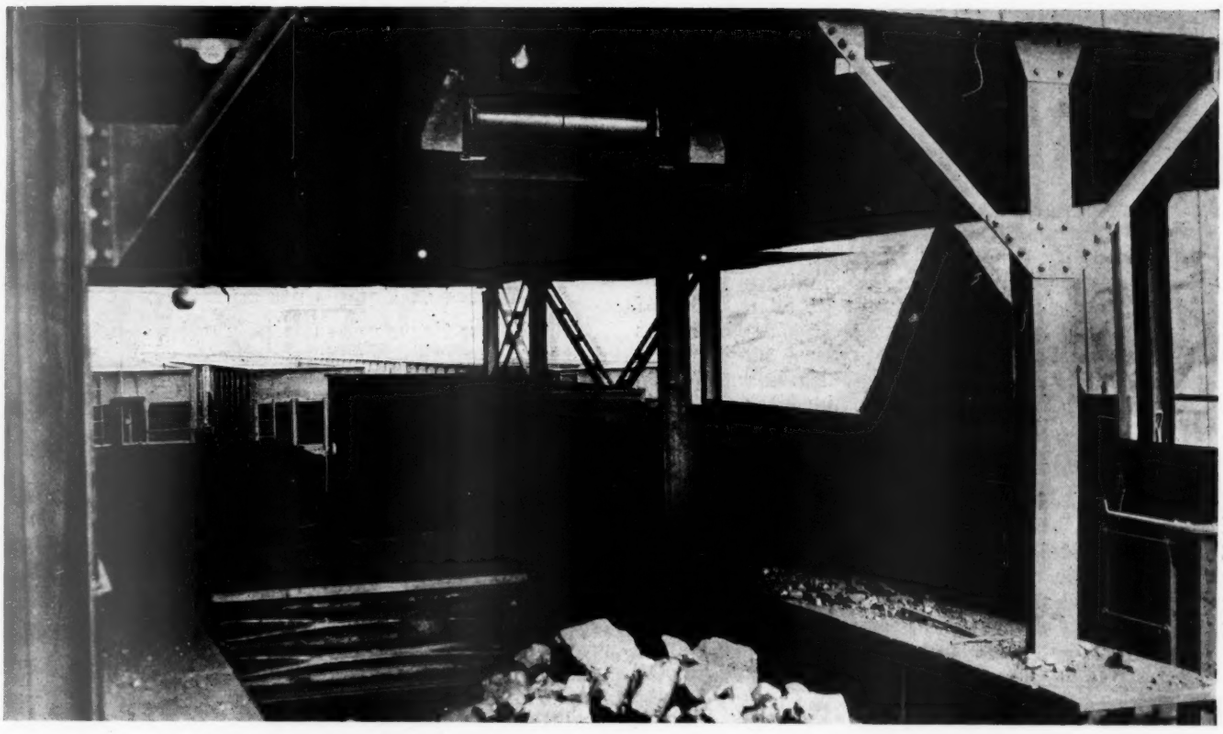
King Coal Registers a Complaint



Hopper-car doors should not be made tight with straw — Old holes in sheets should be plugged with rivets

THE operations of the new car shop at Ridge Point were progressing satisfactorily and the shop had settled down to the business of turning out an average of 80 rebuilt cars a week with hardly a hitch in the operations. This enabled Carson to devote a greater part of his time to following up other duties connected with his job as general car foreman of the Lakewood division. A great part of the traffic originating on the Lakewood division came from the bituminous mines scattered through that territory and one of the greatest sources of the complaints that were being received every day by the division superintendent from the coal traffic department was the fact that the railroad was furnishing 50- and 70-ton hopper cars for coal loading at the mines with openings around the doors and hopper sheets. The condition of these cars was responsible for heavy loss of coal during shipment and resulted in many expressions of dissatisfaction and claims for damages from the shippers.

Carson took time one morning to get out all of the correspondence in connection with these complaints and he discovered that the name of the Standard Coal Mining Corporation appeared most prominently in the files. Most of these complaints were due to the fact that the railroad had



Lump coal is fast losing its prestige in industrial use although there is still a large demand for it for domestic and household purposes

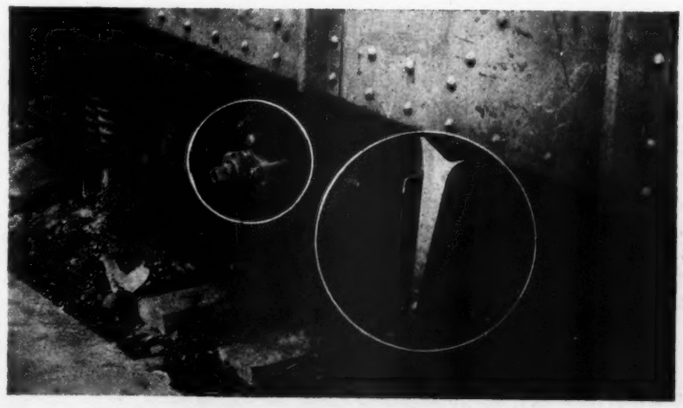
Increased demand for tight bottom coal cars brought about by changing conditions at the bituminous mines

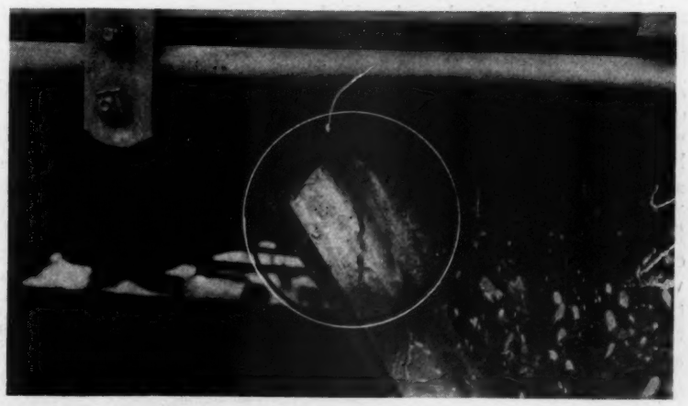
By A General Car Foreman

been furnishing hopper cars in unsatisfactory condition to that company's Forest Grove mine located at a point on the line about 18 miles north of Ridge Point shops. Carson decided at that moment that the easiest way to get to the bottom of the situation was to make a personal visit to the mine and look at these conditions from the standpoint of the mine operator. He figured that he would then be in a better position to see what could be done to improve conditions and eliminate complaints.

When Carson dropped off at Forest Grove the next morning and finally reached the Standard Coal Mining Corporation's mine, he was immediately impressed with the fact that he was viewing the property of one of the most modern bituminous coal operations he had ever seen. The buildings and equipment, he learned, represented an expenditure of over two million dollars and all of the operations of the company were being carried on under the most up-to-date conditions and with the aid of mechanical coal cutting and loading equipment exclusively.

The mine superintendent asked Carson if he would not care to see the entire opera-





It is sometimes necessary to renew the door locking mechanism — Repairs to openings around the doors are made by heating and straightening

tion in order that he might learn what their problem was from the ground up and together they went underground and watched the operation of mechanical coal cutters which not only cut the coal but lifted it and loaded it by means of continuous belts into the mine cars, from which it was later transferred to a storage bin having a capacity of 200 tons. This storage bin was located underground and the coal from the bin was fed onto an endless belt 800 ft. long which brought the coal to the surface and transferred it on to another belt which carried it to the cleaning house.

At the cleaning house the coal was put through an air cleaning process and at the same time all particles of slate and other non-combustible matter removed. It was then separated for size and quality and continued on endless belts to the tipple from which it was loaded from any one of four chutes into the 50- and 70-ton hopper cars for shipment.

Powdered Coal the Real Problem

Carson realized before he had gone very far in his inspection of the coal company's property and operations that he had not kept abreast of the times in the developments in the coal mining industry and that his conventional ideas that the larger sizes of lump coal predominated for industrial use were all wrong. The mine superintendent explained to him that the demand for large lump coal for industrial use was decreasing all the time and that practically the only demand for the larger sizes of coal was for domestic consumption. This, of course, still represented a large market. It was explained that most of the coal now being ordered for industrial consumption was of ¾-in. screen or less due to the demand for powdered coal for use in stokers and air feeding devices in power plants and industrial establishments such as steel and tube mills, cement factories and electrical equipment manufacturing plants.

The mine superintendent pointed out to Carson that research had developed the fact that, considering the manner in which powdered coal is used in furnaces, from 9 to 18 per cent more heat is obtained from coal in this form than from coal in the lump form. A large number of industrial plants had been crushing and pulverizing their own coal after purchasing in the lump form which, of course, added considerable to the cost of handling the fuel as well as the necessity of maintaining the proper equipment to do this work. More and more the mining companies have been called on to furnish crushed coal, particularly those equipped with necessary mechanical facilities for doing this work.

Why Cars Are Rejected

In regions where iron ore forms a large part of the traffic, it is not an uncommon sight to see hopper cars closed in around the doors and holes in the bottoms or sides of the car filled with wood, straw or burlap to prevent the sifting through of the contents. This has been especially noticeable in many of the modern 50- and 70-ton hopper cars which are normally used for coal, ore, sand, stone or for almost any other commodity which the railroads received for shipment and for the handling of which no specific type of car has been set aside by the carrier.

The cars arriving at coal mines for the loading of fine coal which contain straw, wood or burlap must either be rejected or conditioned. When cars are loaded with foreign matter of this kind in the cars it is more than likely that the entire shipment will be rejected by the consumer's inspectors for one of the following reasons:

(1) Upon arrival of the coal at industrial plants, it is stored in self clearing bins of between four and five thousand tons capacity so that the cars may be released and the payment of demurrage charges eliminated.

(2) Screens at the bottom of the storage bins are provided in order to prevent any foreign object entering the dryers.

(3) If these screens are clogged up with objects such as wood, straw or burlap, in many cases it requires the removal of from two to four thousand tons of coal in order to clear the screens.

(4) The temperature of the dryers is high enough to dry crushed coal without ignition but objects such as wood, straw or burlap will ignite at lower temperatures and if allowed to enter the dryers will cause explosions with resultant damage to the plant.

Causes of Complaints on Equipment

The Forest Grove mine normally ordered from 80 to 100 hopper cars a day and approximately 60 per cent of all the cars loaded were required for fine coal loading. Obviously these cars had to be in such condition as to prevent the loss of fine coal while in transit and to make it unnecessary to resort to some of the usual methods of stopping up leaks in order to make them suitable for this loading at the mines. Carson took it upon himself to make a personal inspection of practically all of the cars that had been furnished the Forest Grove mine for that day's loading and he had not proceeded very far before he discovered that either the car inspectors who were selecting the cars, or the yardmasters responsible for moving the cars to the mine tracks were guilty of pretty lax methods in handling their job. He found many of the cars with from a half to two tons of ore, slag, coal or other refuse still in them, indicating that they had not been cleaned out before forwarding to the mines for loading. Rather than risk the delay of ordering other cars, the mine operators had found it necessary to clean out these cars and render a bill against the railroad company for the expense involved or else, in many instances, it was necessary for the railroad company to place a man at the mine to perform this work. None of the cars that Carson looked over bore clean-out cards, which are supposed to be applied by the car inspectors to indicate to the transportation department that the cars should have been cleaned out before being placed for loading. Almost every other car that Carson looked over had openings around the bottom doors and hopper sheets that made them absolutely unsuitable for fine coal loading, yet these cars were being selected for this loading by his own car inspectors and the numbers turned in to the yardmaster's office.

As the Forest Grove mine was located at a rather isolated point and as there were no facilities there for properly cleaning cars, he decided that to place a man or a force of men at the mine especially for car cleaning was out of the question. Something had to be done immediately to remedy conditions at this particular mine and he assured the mine superintendent that he would take such steps as might be necessary to correct the trouble and assure the placing of cars for loading at the mine in suitable condition for any size coal that they might wish to load. Carson returned to his office at Ridge Point with a feeling that he had learned something that every general car foreman should have known and by viewing the situation from the mine operator's standpoint, he should at least be in a better position to save his company a lot of trouble and money.

Remedying the Conditions

Even a casual inspection of many of the hopper cars in service on that division would disclose the cause for the openings around the doors of the cars. Most of these cars had recently been used to handle iron ore shipments and the continuous strain caused by the

dropping of six to seven tons of ore from the buckets of the ore unloading machines had caused the doors and hopper sheets to spring and the door channels or latches which hold them in place to bend, thereby leaving openings around the sides and the bottoms of the doors which rendered the cars practically useless for any class of loading. To close up these openings was not a serious matter. Many of these cars could be put in condition merely by heating the door latches and straightening them while the doors were jacked to a closed position. In other instances outside hopper sheets could be set into place by heating the sheets and striking them with a 12-lb. maul. This same method could be followed in some cases without the necessity of heating the sheets.

He found so many cars requiring some attention in order to fit them for fine coal loading that he decided to set aside two tracks, each having a capacity of 30 cars for handling this class of work. He assigned two car repairers, one experienced in the use of a blow torch or acetylene outfit, one helper and a box packer and oiler to each track. He decided that while the cars were going over these tracks the box packers could set up the packing and otherwise attend to the journal boxes so that the cars would at least give no trouble from this source. Within a few days after the operations were pretty thoroughly organized, it was found possible for this force of eight men to condition about 60 cars a day and turn them out so that there could be no possible complaint from the mine owners when these cars were placed at the mine for fine coal loading.

On many of the cars it was found that by adjusting the door mechanism at the eye bolt at the center of the bottom door channel, the doors could be made sufficiently tight to accommodate any class of loading. In other cases it was necessary to renew the door-shaft ratchet wheels and pawls. To perform either of these operations required very little time and, even though in some cases it was necessary to heat the bottom door channels, the doors themselves or the inside or outside hopper sheets, no difficulty was experienced in conditioning 60 cars a day with the force assigned. It was found that this not only provided sufficient tight-bottom cars for loading coal at the Forest Grove mine, but enabled the local yardmaster to assign tight-bottom cars to other mines in the Lakewood district where the same conditions had existed to a somewhat lesser extent than at the larger mines.

Maintaining the Condition of Cars

From that time on, all empty hopper cars were given a thorough inspection by the car inspectors on arrival in the yards and those found in need of conditioning for powdered coal loading were carded to the two special conditioning tracks which had been set aside for this work. Cars that were in need of cleaning were carded with clean-out cards and an order was given to the yard office by the car inspector to have this work done by section men or track laborers before the cars were sent to the mines for loading or before they were sent to the repair tracks for conditioning.

It was further developed that some cars, when rebuilt, were allowed to leave the shops with holes in the sides and floor sheets. The right sheets not being in stock at the time the cars were going through the shops, other material was substituted and new holes punched when the sheets were refabricated, leaving the original rivet holes open. The same was true of many hopper sheets, the old style door-shaft mechanism having been replaced with door latches fastened to the outside hopper sheets and the inside holes in the hopper sheets not having been filled.

While Carson was on his inspection trip at the Forest Grove mine, the superintendent had pointed out to him that one ¾-in. hole in the floor of a car would allow about 1,000 lb. of powdered coal to sift out during a 150-mile movement of the car. Therefore, Carson impressed upon his repair men and inspectors that all holes in hopper cars, even though they be as small as ⅝-in. rivet holes, be filled with rivets to eliminate the losses of fine coal.

By constant attention to this particular class of cars, Carson was able to eliminate most of the complaints and he made it a point to keep in touch with the situation by visiting the various mines in his territory periodically. On some of his visits he found that in many instances unsuitable cars were still being placed for loading for the reason that yard switching crews had either neglected to switch the cars out and place them on the repair tracks as ordered or that the car inspectors themselves had failed to detect the unsatisfactory conditions. By keeping constantly before the inspectors the necessity for weeding out all of the unsuitable cars, he was able to make so much improvement in the condition of empty cars placed at mines that the mine operators not only ceased to complain to the railroad regarding the few cases that came to their attention but in some cases had made it a point to commend the railroad company for the improvement in the situation.

Under these changed conditions the mine supervisors had become rather resourceful in many instances in caring for the few cars that might slip through the inspection net. They conditioned these cars by using a 50-50 mixture of fire-clay and fine coal to fill up the openings around doors where they were not too large or else the cars were allowed to run through to the chutes where lump coal was loaded. The fire-clay and coal combination not only served to retain the coal in the cars, but would pulverize while the cars were being unloaded at the consumers' plants and therefore, could give rise to no complaints on the part of the consumer unless the fire-clay mixture had been used to such excess as seriously to affect the quality of the fuel.

As Carson reflected upon the ease with which he had been able to wipe out a source of serious complaint and plenty of trouble, he wondered whether or not there might be many other situations in which it would profit any general car foreman to get away from his job once in a while long enough to look at the railroad from the shipper's or consumer's viewpoint. He made up his mind then and there that he was going to sell his company with the idea of demanding that the general car foremen and other similar supervisors all over the system make it a point to get acquainted with their shippers and find out why complaints were received from time to time on the condition of cars and how the causes for these complaints might be eliminated by improving shop operations or tightening up on inspection.

THE GERMAN STATE RAILWAYS have developed a new type of train for handling express packages, in order to compete with highway transportation, according to Department of Commerce reports. These "light freight" trains consist of a locomotive and two cars. Easy movement from one car to another facilitated by a vestibule similar to that used on Pullman cars. The cars are well lighted and heated and provide facilities for performing certain clerical work (preparing and filing freight bills, etc). Their usual speed is 65 to 75 kilometers (40 to 46 miles) per hour.

Further Proceedings at Traveling Engineers' Convention

Symposium of "The Locomotive of Tomorrow" outstanding —Report on locomotive piping

As stated in last month's preliminary report of the annual meeting of the Traveling Engineers' Association, held at the Hotel Sherman, Chicago, September 23 to 26, inclusive, one of the most unusual and interesting features of the entire convention was the day's session devoted entirely to a discussion of "The Locomotive of Tomorrow." This discusson brought to the convention some of the leading minds in the field of locomotive design and construction, as well as railway officers, familiar, through long experience, with locomotive performance requirements.

The stress laid on increased speeds as one of the most important requirements of future locomotives was striking. Out of a total of ten speakers, six forecast substantially higher speeds (up to 100 m.p.h.) as practicable and essential if the railways are to meet successfully the challenge of highway and air competition. Three speakers emphasized the trend toward higher boiler pressures, which, in the upper ranges, means getting away from the conventional fire-tube boiler. The economic advantages of electric locomotives and internal combustion equipment for use in territories of unusually great traffic density, heavy grades, tunnels, certain branch-line work and switching in industrial areas were admitted, but it was prophesied that improvements in the steam locomotive in the next ten years, for example, will make it increasingly hard to beat as a motive power unit in the service of the railways and the public.

Prior to the formal opening of the meeting, which was presided over by Samuel O. Dunn, editor of the Railway Age, a communication was read from R. H. Aishton, president, American Railway Association, who said that he has no crystal sphere in which to view the locomotive of the future, but that it will be the result of a competitive struggle, with the prize awarded to that design which affords the greatest power, speed, economy and dependability with safety. Mr. Dunn then addressed the association briefly, saying that the introduction of the steam locomotive inaugurated a revolution in transportation and that the development of this form of motive power to its present state of effectiveness has been perhaps the greatest single factor in American industrial progress. For this progress, he said, due credit must be given to the initiative, courage and engineering skill of the locomotive builders and auxiliary-equipment manufacturers.

George Houston, president, Baldwin Locomotive Works, delivered a prepared address, one of the most important points of which was the contention that American locomotives, in general, are maintained and given a service life far beyond the point of true economy. He said that if $50,000,000, more or less, taken from the maintenance account annually, were applied through increased depreciation accruals or retirement charges to the purchase of new power, the result would be a substantial net reduction in maintenance and operating costs, coupled with a marked improvement in train operation strengthening the position of the railroad to meet the competition and motive power needs of tomorrow.

W. C. Dickermann, president, American Locomotive Company, said that no limit has been set to the eventual capacity of the steam locomotive and that the only thing that can be predicted with accuracy about it is the gage of track, which has already been standardized. Mr. Dickermann pointed out certain important trends in locomotive design, particularly the use of higher pressures, and described some of the experimental steam locomotives now being constructed in this country and abroad with working pressures of 850 lb. per sq. in., and over. He also commented on the possibility of Diesel, steam-turbine and unaflow engines, poppet valves, variable exhaust nozzles, fan draft and many other details of interest.

W. E. Woodard, vice-president, Lima Locomotive Works, Inc., emphasized the necessity of adequate sustained power-generating capacity in locomotives, in order that the rest of the railway plant, including the right of way, tracks, bridges, terminals, signals and all of the vast railway properties, may give the most effective service in producing transportation.

Following the three locomotive builders, T. W. Demarest, general superintendent of motive power, Pennsylvania, Western Region, said that future motive power must meet the increased speed requirements and that schedule speeds of 90 m.p.h. with 1,000-ton passenger trains, and 60 m.p.h. with 5,000-ton freight trains, are not beyond the bounds of practicability. Mr. Demarest referred to electric locomotives, Diesel locomotives and other types of motive power and predicted that the locomotive of the future will be not any one of these to the exclusion of the others, but each will be used in the particular field for which it is best adapted.

Silas Zwight, general mechanical superintendent, Northern Pacific, presented a paper which was read by G. F. Endicott, mechanical engineer, describing the recent changes and improvements in Northern Pacific locomotives. He said that locomotives are now about five times as large and powerful as when he first entered the service of the Northern Pacific in 1888. He paid a tribute to the superheater, feedwater heater, thermic syphon, exhaust feedwater heater and stoker, maintaining that these locomotive appliances have played no small part in the development of the locomotive to its present state of efficiency. Mr. Zwight referred to the opening of the Rosebud strip mine in Montana and the success of the Northern Pacific in developing a locomotive design and grates for the burning of this lignite coal, which presented some unusual problems, owing to its light weight, high moisture content and low unit heating value. He described the progress with an experimental spark ar-

restor and a cinder return system on the Northern Pacific, and closed his paper with the prediction that the steam locomotive will not be supplanted for years to come, its particular development, as in the past, being guided by the driving force of necessity.

M. Macias, assistant general superintendent of transportation, Mexican National Railways, described the present motive power, both standard and narrow gage, in Mexico, and stated that, should conditions require more unit power capacity, the first requirement will be for the construction of heavier roadway and track and stronger bridges. Mr. Macias mentioned the competition which the Mexican railways encounter from highway and air transport, the conditions attendant upon this competition evidently being similar to those encountered in the United States.

Following the three railroad representatives, S. G. Down, vice-president, Westinghouse Air Brake Company, pointed out how the air brake has contributed indirectly to the efficiency of the modern locomotive and described the detailed improvements now under way and in prospect which will be available for the motive power of tomorrow. G. L. Bourne, chairman, The Superheater Company, presented a paper, read by R. M. Ostermann, vice-president, in which he predicted a marked reducton in the amount of steam and fuel used per indicated horsepower-hour, coupled with a marked increase in the horsepower capacity at speeds. Increased steam pressures and higher degrees of superheat will be important contributing factors, in the opinion of Mr. Bourne. John E. Muhlfeld, consulting engineer, New York, paid a tribute to the steam locomotive which, while still an infant, is remarkably well adapted to the requirements of rail service because of its direct drive, flexibility as regards both power and speed, and its relative simplicity and cheapness. Mr. Muhlfeld also predicted increased boiler pressures, power capacity and operating speeds.

An abstract of one of the committee reports; namely, that on Locomotive Piping, follows.

Piping of Locomotives

Twelve cardinal points should be watched carefully if locomotives are to be properly piped. They are as follows:

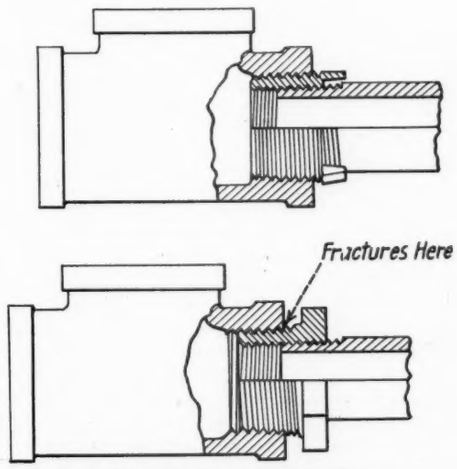
Select proper materials according to the temperature, and pressure requirements for all steam piping, particularly valves.
Use extra heavy material throughout.
Eliminate the use of bushings and street ells.
Use correctly designed brazing tail pieces.
Locate valves properly.
Install valves properly.
Use union fittings throughout.
Reduce the number of joints to a minimum.
See that pipe threads are cut to gauge.
Bracket pipes correctly.
Allow for expansion and contraction of piping.
Keep pockets out of all lines of pipe.

Selecting Proper Material According to Temperature and Pressure Rating

This is one of the most important points to be considered, and, as a starter, we wish to give it as our unanimous opinion that the manufacturers' rating as to the maximum temperature and pressures allowable on material should be accepted by the railroad officers. The manufacturers maintain elaborate metallurgical laboratories and testing departments and their recommendations should be given due consideration when material is being specified.

In recent years there has been a steady advance in steam pressures and a widespread adoption of the central station practice of using superheated steam on all auxiliaries. Improvement in superheaters has increased the maximum temperature available from around 600 deg. F. to more than 700 deg. F. Metals which were satisfactory under the old conditions are not at all satisfactory under the new, as the table showing the effects of high temperatures on metals very clearly shows. As the first step in the proper piping of locomotives, see that the metals used in the valves and fittings are suitable for the temperature conditions to be met.

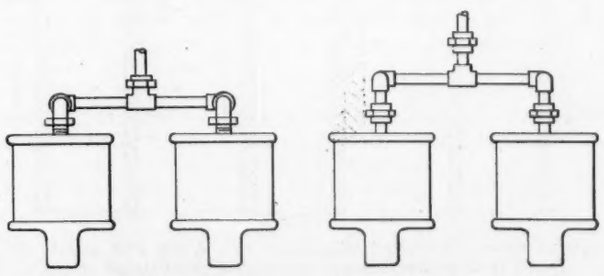
Where steam temperatures never exceed 500 deg. F.



Point where failure usually occurs with shoulder-type bushings

brass-bodied valves may be used, as cast brass of good quality containing not less than 86 per cent copper maintains its strength very well at this temperature. The bonnet may be of cast or forged brass, the latter to be preferred, as it is much more uniform and tougher. Stems may be of rolled or forged brass. Stem and bonnet-thread wear should not be excessive with properly designed threads under these temperature conditions. Discs should be bronze where valves with integral seats are used, because of its durability. From a strictly temperature standpoint there is nothing at all difficult about providing a valve to meet the requirements of this class of locomotive.

The use of highly superheated steam for the operation of auxiliaries has introduced new conditions, however.



Left: 14 joints, 5 fittings, 9 threads—Right: 22 joints, 8 fittings, 19 threads

It is plainly evident when we consult the table giving the effects of high temperature on metals that no brass or bronze of any description is suitable for a temperature in excess of 550 deg. In fact, 500 deg. is the actual practice limit on cast brass, only the harder bronzes in which

lead and zinc have been eliminated being good for 550 deg.

Inasmuch as our newer locomotives are being equipped with superheaters which will give average temperatures in excess of 665 deg. with a maximum around 720 deg. it is absolutely essential that valve metals be watched carefully. To meet these conditions, it is necessary to weight fittings to locomotives instead of extra heavy as required by the federal inspection rules. We are aware of the fact that much of the piping on an engine is subjected to relatively low pressure and temperatures and that standard weight material is amply strong. However, when these fittings are used at all, they may eventually find their way into the cab on steam lines and result

Table Showing the Effects of High Temperatures on Metals Used in Steam Valves and Fittings

Special Brass

Deg. F.	70	200	300	400	500	600	700	800	900
Tensile strength, lb. per sq. in.	37,050	37,150	35,500	34,000	29,200	16,250	13,500	8,900	7,740
	38,100	.....	36,400	30,500	.....	.....	.....	.....	.....
Average	37,575	37,150	35,950	32,250	29,200	16,250	13,500	8,900	7,740
Elastic limit, lb. per sq. in.	16,250	15,500	14,500	15,100	13,000	13,000	13,500	8,900	7,740
	16,600	.....	18,000	13,300	.....	.....	.....	.....	.....
Average	16,425	15,500	16,250	14,200	13,000	13,000	13,500	8,900	7,740

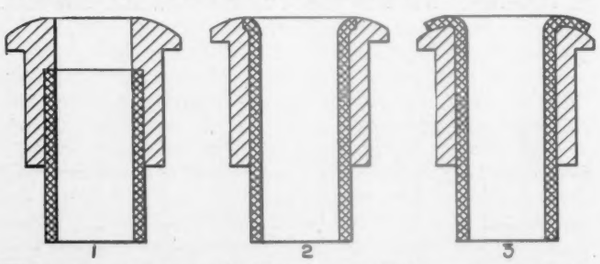
"Hard Metal"

Deg. F.	70	300	350	450	600	750	950
Tensile strength, lb. per sq. in.	35,750	36,320	.....	34,350	27,590	23,900	.....
	35,290	.....	.....	33,140	27,790	22,090	.....
	31,500	35,700	.....	29,900	19,000	16,800	8,400
	32,080	31,950	.....	29,500	19,550	17,080	.....
	35,750	.....	.....	32,750	21,530	17,050	.....
	.....	.....	.....	.....	21,610	.....	.....
	34,000	35,100	34,700	30,250	26,000	18,500	12,480
	33,800	33,800	34,650	32,800	21,300	18,780	11,600
	31,700	32,800	.....	.....	24,400	.....	.....
	.....	.....	.....	.....	22,750	.....	.....
Average	33,735	34,280	34,675	31,180	23,150	19,170	10,825

Cast Steel

Deg. F.	70	200	300	400	500	550	600	700	800	900	1000	1100	1200
Tensile strength, lb. per sq. in.	80,500	73,350	71,000	70,800	74,450	76,550	75,700	68,800	59,800	48,400	35,900	26,200	21,700
	81,350	73,650	71,325	72,600	74,750	76,950	76,000	71,150	60,900	50,300	42,450	32,400	24,400
	77,200	71,450	68,300	68,650	71,500	72,800	72,200	67,700	57,800	48,800	31,750	29,650	23,100
Average 79,680		72,820	70,210	70,750	73,570	75,425	74,630	69,220	59,500	49,170	36,700	29,420	23,070
Elastic Limit, lb. per sq. in.	48,300	41,500	41,500	38,000	36,000	35,000	35,000	34,500	31,500	28,500	23,000	17,750	16,900
	42,000	36,500	35,750	36,500	35,000	36,500	37,000	36,000	32,500	37,000	29,500	25,000	18,500
	40,000	37,000	35,500	33,000	34,500	34,000	34,000	37,500	33,500	28,500	23,000	21,000	17,000
Average 43,430		38,330	37,580	35,830	35,170	35,500	35,330	36,000	32,500	31,330	25,170	21,250	17,470

invade the field of the central station and the oil refinery and borrow the metals which their experience has proven to be satisfactory. For valve bodies, we have now a choice of forged steel, cast steel or cast monel, each of which is suitable for a temperature of 750 deg. Bonnets are more difficult. Unless the outside screw and yoke type is used or special alloys developed for the inside screw type, serious difficulties will be experienced with stems binding. High temperature valves are always provided with renewable seats, and here again special alloys should be used designed to withstand the



Three types of brazed tailpieces: (1) Weak and unsafe design; (2) improved design, combining mechanical strength with brazing; (3) unbrazed joint requiring careful workmanship but providing maximum mechanical strength

severe cutting effect of the steam. Discs also should be carefully designed, as with the usual installation the disc bears the brunt of the wear.

Considerable difficulty has been experienced by many railroads in preventing the application of standard

either in engine failures or the tying up of locomotives when the inspectors discover them. The total cost of all the fittings on a locomotive is so small and the increase in price of extra heavy material over standard weight is so low that it is well worth while to use the former exclusively. It may be well to mention here that the American Railway Association adopted the new 300-lb. A. R. A. unions and union fittings at the convention in Atlantic City last June.

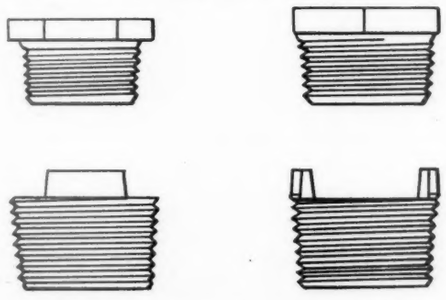
There are certain elementary facts in regard to the use of pipe fittings which should be borne in mind whatever kind of locomotive is in consideration. One of them is in regard to the use of bushings. We all know that a bushing is a fitting having internal and external pipe threads and is used in connection with some other fitting to provide a reduced female threaded opening in that fitting. They are made in two types, shoulder and face, as shown in the illustrations. The shoulder bushing is easier to apply than the face bushing and therefore is far the more popular of the two. Although bushings can be obtained to reduce two or more sizes, a vast majority of these fittings are used to make a reduction of only one pipe size. Such fittings are exceedingly weak structurally because the amount of metal left between the root of the male thread and the root of the female thread is very slight. If a shoulder bushing of this type is used to make a piping reduction in a fitting, observe what happens. The bushing is screwed into the fitting and then the pipe is screwed into the bushing. Owing to the depth of the shoulder on the bushing, the end of the pipe when screwed tight into the bushing comes approximately flush with the face of the fitting into which the bushing is

screwed. Under these conditions the entire strain of the joint is carried on the thin wall of the bushing where it joins the fitting. Not a great deal of strain is required to fracture the bushing.

Face Bushings Preferred But Not a Panacea

The face bushing is considerably shorter than the shoulder bushing and when one is used under the identical conditions given above, it will be found that the end of the pipe comes well inside the face of the fitting into which the bushing is screwed. Under these conditions the metal of the fitting backs up the thin wall of the bushing and the joint is much stronger than in the case of the shoulder bushing. In either case, however, a great deal of reliance is placed on the strength of the bushing, which, as we have said, is the weakest of all pipe fittings. Reducing size fittings are available in all combinations of sizes at the present time and there is no longer any real necessity for the use of bushings. In view of the fact that 60 per cent of all piping failures are due to bushings, we believe that their use should be unhesitatingly condemned.

Another fitting which has been the source of considerable trouble is the street ell, an elbow fitting having a female thread on one end and a male thread on the other.



Two views of a shoulder bushing (above)
Face bushing (below)

These fittings are usually made in straight sizes and are used in place of a female elbow and a close nipple because they are easier to make up. Outside of the fact that they save one threaded joint, they have nothing to recommend them. Unless they are made of forged or cast steel, the metal is much weaker on the male end than a pipe nipple would be and failures are very common at this point. It is impossible to provide sufficient strength at the male end without reducing the internal area, which is, of course, objectionable. Therefore street ells are not found on a well-planned piping job.

Correctly Designed Brazing Tailpieces

Still another fitting which frequently causes trouble is the brazing sleeve used to connect copper pipe to a valve or fitting. The outside diameter of these sleeves is limited by the size of the coupling nut on the fitting and the thickness of the metal of the sleeve is frequently cut to the minimum by the use of the largest possible copper pipe. Unless such joints are properly made, failures are apt to result. Three types of such sleeves are illustrated.

One important cause of trouble with locomotive valves is their location on the average locomotive. Steam for the operation of auxiliaries is usually taken from a small cast header called a turret, located on top of the boiler in the cab or just in front of it. From this point the piping to the various auxiliaries is usually dropped down so as to place the operating valves within reach of the enginemen.

This introduces a water leg above each valve so located and is exceedingly detrimental to the life of the seating surfaces. Valves taking steam from a header should always be located at the highest possible point, preferably above the header itself. The arrangements followed on the newer locomotives whereby the intermediate throttle valves are eliminated and the steam-driven auxiliaries are controlled directly from the turret valves is very satisfactory. Reducing valves used on a steam heat line should always be located at the highest practical point, as the presence of condensation in the steam has a very injurious effect on their delicate mechanism. The outlet piping from such valves should always be kept full size and as free from abrupt turns as possible.

Proper Installation of Valves Essential

As a general rule, globe valves used for throttling or blow-off purposes should be installed with pressure on top of the disc. This is contrary to the generally accepted practice among pipe-fitters, but has been proved to be correct beyond all question of doubt by numerous tests.

The argument that valves installed in this way tend to leak through the packing box is a fallacy. The objection is sometimes made that it is impossible to pack valves so installed as the pressure cannot be shut off from the packing chamber. This, too, is incorrect, as all modern valves have a seating arrangement on the stem so that opening the valve wide engages an auxiliary seat in the bonnet and cuts off contact of the steam with the packing. Valves installed with pressure under the disc are apt to leak quickly, because when they are closed the steam is no longer in contact with the stem, which contracts sufficiently on cooling to pull the disc off the seat. With pressure on top of the disc, this condition does not occur. In fact, the pressure tends to hold the disc tight against the seat at all times.

Reduce the Number of Joints to a Minimum

Some years ago an extensive investigation into the subject of air-brake piping indicated clearly that the number of joints in this piping on the average locomotive ranged between 450 and 500. This was before the widespread use of union fittings and no doubt still applies to such locomotives as are piped without these fittings. As a contrast, consider that today the air-brake piping on a locomotive equipped throughout with union fittings contains not over 205 joints, a reduction of 300 joints or over 50 per cent of the total. Think what that means. It means 300 less chances for leakage. It means a large reduction in the labor charges in applying and removing piping, and it means a large reduction in the amount of material carried by the stores department.

One thing which may have been remarked is the fact that with the reduction in joints by the use of union fittings there is a large reduction in the number of threads which must be cut. It has been our experience that threads cut on pipe by means of the tools ordinarily used by pipe-fitters are far from satisfactory for locomotive work, where vibration strains are excessive.

We believe that it would be a profitable undertaking for the railroads to investigate the matter of equipping their shops with tools capable of cutting correct threads. Such tools can be obtained readily and at a reasonable cost. More attention should also be paid to the matter of gaging shop-cut threads.

One of the most essential things to watch in properly piping a locomotive is the bracketing of the pipes. Thirty-five per cent of the failures of air-brake equipment are caused by broken pipes. In practically every case it will be found that such breaks are located at the weakest point of the pipe—just outside the fitting where the un-

(Concluded on page 633)

Car Men Discuss Billing and Interchange Rules

Detroit meeting of Car Department Officers' Association gives detailed consideration to the important subject of A. R. A. rules

PRELIMINARY reports of the Car Department Officers' Association convention at Detroit, August 26 to 28, inclusive, have been published in preceding issues of the *Railway Mechanical Engineer*, the discussion of A. R. A. billing and interchange rules being reserved for this issue.

The meetings on rules were presided over mostly by Past-president C. J. Wymer, superintendent of the car department, Chicago & Eastern Illinois, although Mr. Wymer was relieved occasionally when President-elect K. F. Nystrom, superintendent of the car department, Chicago, Milwaukee, St. Paul & Pacific, took the gavel. The report of the Committee on A. R. A. Billing was read by Chairman E. S. Swift, chief A. R. A. clerk of the Wabash, Decatur, Ill., and will appear in a later issue.

M. E. Fitzgerald, general car inspector, Chicago & Eastern Illinois, Danville, Ill., read the report of the A. R. A. Rules Commitee, of which he is chairman. In introducing his report, Mr. Fitzgerald said: "You appreciate the fact that anything we say in reply to questions presented here is merely the opinion of this committee, with a view possibly to bringing about a more equitable interchange. We feel, however, that it would be well if you would understand the fact that later, through interpretations or changes, the Arbitration Committee of the American Railway Association may take action which will change these conclusions."

Space limitations prevent the inclusion of the complete report of the A. R. A. Committee in the *Railway Mechanical Engineer*. Consequently, the questions, answers and discussion relating to the following rules are omitted: Nos. 2 (second paragraph), 4 (first paragraph), 30, 68, 75, 86, 87 and 12 (passenger car). The members voted to eliminate all discussion pertaining to Rule 17, so this is also omitted. Three communications, pertaining to Rule 4, are published as a unit in this issue.

A. R. A. Committee Report

During the many active years of this organization, functioning either as the Master Car Builders' and Supervisors' Association or otherwise, the duties of your A. R. A. Committee have been to bring before you recommendations for changes in interchange and loading rules, and, so far as possible, to make a study of the many perplexing problems arising and to suggest a method of handling such as might be of mutual benefit to the interests we serve.

With that end in view, and realizing that we must have the co-operation of the membership, your committee appealed to a representative number of railroads interested in your organization, requesting that a study be made, analyzing the situation with respect to the application of Interchange and Loading Rules then in effect, and requesting that any suggestions which might tend toward a more equitable interchange condition be called to the attention of your committee.

Many communications were received treating with interchange and repair conditions in general, as will be indicated in report following, which will include certain questions presented, with your committee's suggestions for cooperative handling, and certain communications quoted dealing with many important features in connection with the handling of repair and interchange work.

Rule 2

Question: It would seem that under the provisions of Rule 2, sec. (b), third par., treating with leaky tank cars, that it would be mandatory that owners be immediately notified as to the leaky condition of tank car; and further considering the provisions of A. R. A. Rule 1 and A. R. A. Rule 16, that repairs to leaky tank cars should not be undertaken by intermediate lines, and that such cars should be immediately reported to car owner and the car moved at the direction of owner to point of proper repairs. Considering the provisions of rules above quoted, is it proper for handling lines to attempt to make repairs to leaky tank equipment?

Opinion of Committee: It would seem that in the majority of cases leaky tank cars should be properly stenciled, reported, and moved at the direction of car owner for repairs, as provided in A. R. A. Rule 2, sec. (b), page 12, third par.; yet it is clearly apparent that there might be some exceptions to the general application of such rule: for example, minor leaky conditions due to loose hand-hold rivets, or some such similar leaky condition which it would appear could and should be corrected by intermediate line without the necessity of returning or even reporting car to owner, other than as covered by billing repair cards, which in such cases should be forwarded to owner.

We would recommend that great care be exercised in the handling of repairs to tank-car equipment, and that no extensive repair work should be undertaken by intermediate line without the authority of car owner, or without affording car owner an opportunity of taking care of such work as he might deem best. When reporting equipment to owner under such conditions, all of the defects found should be carefully reported and the circumstances under which damage occurred. Such cars, when moved at the direction of owner to repair plant, should be handled in accordance with the provisions of Interpretation 2, Rule 4, page 23, your attention being particularly directed to that part of the interpretation reading:

". . . In addition to the regular billing, such cars shall be side carded on both sides, showing name of railroad or company forwarding car. . . ."

Rule 4

Question: How shall a car owner be protected for concealed unfair damage, when it cannot be seen without stripping car, keeping in mind the possibility of such a car's being subsequently damaged after leaving road which had issued defect cards for extensive exterior damage? See Decisions 926 and 1118.

Opinion of Committee: It would seem that there should be very little occasion for many controversies of this nature arising, and that the question will probably be well taken care of

under provisions of rules promulgated at the last Convention of the A. R. A., held at Atlantic City in June, 1930, and affecting this particular phase of car damage.

There is nothing contained in the present Rules of Interchange which compels an intermediate line to accept and handle damaged equipment without proper defect card protection, and regardless of arguments to the contrary, we feel that all exterior visible defects on damaged equipment should be properly carded at point of interchange.

Treating with the question of concealed damage, this question would then be properly confined to insulated cars, refrigerators, fruit, etc. In such cases, before the acceptance of such equipment in interchange, intermediate lines should have an understanding with the proper authorities on the delivering line, so that with request properly supported by statement from car owner protection for concealed defects would be furnished by the road originally tendering the car in movement in damaged condition. It would seem that we now have power and authority to properly regulate this question, if all concerned would be sufficiently honest and interested to arrange for such protection.

Rule 16

Question: Should not some provision be made to allow as proper repairs the substitution of certain friction draft gears, one for the other?

Opinion of Committee: The A. R. A. have already so provided, and attention is called to the provisions of A. R. A. Rule 101, page 137, and foot note, under the caption "Friction Draft Gears," that part reading:

"In conformity with rule 88, one type of gear may be substituted for another, *if the type substituted conforms to the one removed as to sill spacing and coupler pocket limits,* and defect card should be issued for labor of correcting wrong repairs when such substitution is made." It does not appear reasonable to expect a more flexible provision.

J. E. Mehan (C. M. St. P. & P.): I think the question put up there was one to remove the penalty from the repairing line for the labor of correcting it. There are certain friction draft gears that we do not all have. Here comes the car under load with the friction draft gear broken, and the repairing line, through no fault of its own, is up against the proposition of making repairs. He can not hold the loaded car and order a standard friction draft gear from the owner, so he puts in something that fits all right, and still he is penalized for his labor.

During the war we had a condition whereby there were five friction draft gears that we could substitute, one for the other, and there was no penalty on the repairing line.

That is the point I think the question is bringing out, to see if we could not get more flexbility in repairing foreign cars without any penalty on the repairing line.

M. E. Fitzgerald (C. & E. I.): I would suggest that Mr. Mehan frame a recommendation for a rule change; which should not come up at this meeting.

Rule 20

Question: A. R. A. rules, particularly applying to passenger cars, do not specify maximum or minimum height of couplers. Are the heights of passenger equipment couplers the same as those we find in the Freight Code of Rules?

Opinion of Committee: The committee calls attention to A. R. A. Manual of Standards, page 36, sec. C, which for ready reference is quoted below:

"The maximum height of drawbars for freight cars, measured perpendicularly from the level of top of rails, to the center of drawbars for standard-gage railroads, shall be 34½ in., and the minimum height of drawbars for freight cars on such standard-gage railroads, measured in the same manner, shall be 32½ in. for empty cars, and on narrow-gage railroads the maximum height of drawbars for freight cars, measured from the level of tops of rails to the center of drawbars, shall be 26 in., and the minimum height of drawbars for freight cars on such narrow-gage railroads, measured in the same manner, shall be 24 in. for empty cars, and on 2-ft. gage railroads the maximum height of drawbars for freight cars, measured from the level of the tops of rails to center of drawbars, shall be 17½ in., and the minimum height of drawbars for freight cars on such 2-ft. gage railroads, measured in the same manner, shall be 15½ in. for empty cars.

"The standard height of couplers for passenger equipment measured perpendicularly from the level of top of rails to center of drawbars shall be 35 in."

Mr. Mehan: It would be well to eliminate that, because the manual says the height of passenger car couplers shall be 35 in., and gives no tolerance at all, as there is in freight. Rather than confuse anybody, I would rather leave the thing alone until it is decided definitely.

Mr. Fitzgerald: We have the manual of standards. A man asked for this information, and we should like to have his attention called to where he can find the information promulgated by the A. R. A.

Rule 32

Question: There seems to be a great deal of misunderstanding and conflict in connection with the application of Rule 32, particularly Interpretation 6, treating with exterior damage to open-top equipment, brought about by the use of unloading machine, clam shell, or otherwise. At some terminals defect cards are issued to cover any damage which can be detected from an external inspection, and at other points the matter is handled under the provisions of Interpretation 6, Rule 32. It develops that at points handling under provisions of Interpretation 6 very little, if any, information can be developed under the provisions of this interpretation, the result being very unsatisfactory. Some roads make an honest and earnest effort to conduct investigations to determine if damage occurred on their rails, and if damage is so located, defect carding is authorized. Other roads cannot be interested in conducting such investigation.

The committee is earnestly requested to give this matter serious consideration, and we would like to have your opinion as to what would be the best procedure under present interchange rules.

Opinion of Committee: Your committee, after careful consideration, concludes that any damage brought about by use of clam shell, or similar machines, should be rightfully considered delivering line's responsibility, under provisions of Rule 32. However, defect carding for such damage found at interchange points should be confined to parts of equipment damaged by clam shell or similar machinery, coming in contact with, exterior of the car only.

W. R. Rogers (C. I. I., Youngstown, Ohio) What particular rule gives any inspector the authority to issue a defect card for exterior damage by clam shells? I have been looking for it many a day, and I can not locate it.

C. J. Nelson (C. I. I., Chicago): My understanding is there are many conditions under which a railroad might be held responsible that are not mentioned in the rules. In other words, if a car is subjected to unfair mutilation, certainly the railroad that is responsible for it can be legitimately held under the rules.

Mr. Rogers: Can you substantiate that by quoting a rule stating that exterior damage that is the result of a clam shell or unloading device is a delivering line's defect, and if that is the intent of the rules, in the name of common sense why do they not say so?

Mr. Fitzgerald: I ask Mr. Rogers, if I tender him a car tomorrow morning with the side boards and braces bent and distorted to the extent that carding is warranted, if he is going to decline to issue me a card.

Mr. Rogers: I do decline. I consider it clam-shell damage and I do not beat around the bush and call it side-swiping, either.

Mr. Fitzgerald: Will you kindly tell me under what rule you have a right to assume that damage was brought about by a clam shell?

Mr. Rogers: The same right that I have to judge side-swiping or corner damage.

Mr. Fitzgerald: You do not do it. If you did it with the road I represent you would have a lot of bad-order cars on your hands, because on any car tendered with damaged side planks, broken inward from the exterior, we do not care how it is done, the rule is clear and it is a cardable defect.

W. J. Owen (C. I. I., Pekin, Ill.): I should like to substantiate what Mr. Fitzgerald has said. Section B, covers corner-swiping or side-swiping, and Interpretation 3, Page 73, says, "if car is cornered, derailed or side-swiped and

the damage is not caused by any of the conditions named in Section B, is it handling company responsibility?" and the answer is, "Yes."

The conditions named in Section B are only some examples of irregular switching, and apply to cases of unfair usage other than covered by other paragraphs of this rule. That means that a car that is cornered or side-swiped on the side, breaking the stakes or tearing out side planking or side sheathing boards, even though done by a truck backing into it, or a clam shell—in loading with the shovel they sometimes jam the point of the shovel into the car and shove it ahead, nobody can tell just how it happened other than that it has been cornered or side-swiped from the exterior—under these rules it is a cardable defect.

Mr. Rogers: It is not a question with me as to its not being justifiable to defect card it, but I should like to have a rule that would justify it. The rule Mr. Owen quotes is a switching condition. This is a loading or unloading condition.

Mr. Fitzgerald: I will ask Mr. Rogers to present a suggested change in the rules to the A. R. A. committee.

Mr. Mehan: May I ask Mr. Rogers just what rule he is looking for?

Mr. Rogers: I am looking for Rule 32 to say that damage to the exterior of open-top equipment due to unloading devices is a delivering line's defect.

Mr. Fitzgerald: I did not think we would have to go into that.

"Is interior damage at owner's risk when caused by clam shell or other devices used in loading or unloading, where handling line has definite knowledge the damage occurred while the car was in its possession?

"Answer—In such circumstances the interior damage should be assumed by the road which handled it."

Mr. Rogers: That does not answer my question. You are giving me an answer that applies to interior damage.

Mr. Fitzgerald: The committee felt any interchange inspector would card for external damage under the rules. You may submit to the A. R. A. a changed rule, and we will be glad to entertain it.

Mr. Rogers: You quoted a rule that does not apply. That rule covers interior damage, and I know how to handle that. Somebody said the interpretation says something it does not.

Mr. Mehan: Rule 32, as you know, allows you to define handling line responsibility on extent of damage, and for several years it has been predicted upon the manner in which the damage occurred, rather than upon the extent of the damage.

Now, if we have a ruling that says that damage to the interior of the car by a clam shell or other unloading machine is a handling line defect, how could we consistently say exterior damage by the same reason is any other responsibility, and it is only consistent to say the manner in which the damage occurred, whether interior or exterior, should determine the responsibility.

They have defined interior damage here because usually the interior of the car is owner's responsibility, because of it being concealed, but where the handling line knows it was done by a clam shell, they consider that caused by the use of a clam shell or magnet or other device as unfair handling, and therefore the cause of the damage is what governs, not the extent of the damage, and we would be very inconsistent to reason that if we hold the interior damage by that cause as unfair usage, we would be justified in classifying the exterior from the same cause anything else than a handling line's responsibility.

W. P. Elliott (T. R. R. of St. L.): I believe I can see the difference of opinion here. I do not believe there is any question in Mr. Rogers' mind about it being a handling line's responsibility, but it is not a cardable defect under the rules.

Mr. Mehan: The rule is very definite in stating that damage to the interior caused by an unloading or loading machine is the handling line's responsibility. If they say that for the interior, which is the only question asked, could we, under any possible construction of the rule, assume, because it is exterior, that it is any other responsibility? It would be very reasonable to assume the same responsibility exists.

J. A. Truesdale (C. I. I., St. Paul, Minn.): I have had a great deal of experience this summer with clam-shell damage on wooden-top gondola cars. One of the large trunk lines was using another large trunk line's cars for hauling sand and gravel, and the operator of the clam shell was continually dropping it on the top of the side planks of the wooden gondola cars, breaking the top planks down. I issued defect cards in every case under this same interpretation.

It does not say exterior, I will admit that, but when you break a side plank, you break the interior of it as well as the exterior, and the same when you break a side stake, so I can not see why the interpretation does not apply. I have issued defect cards in each case.

T. F. Cheadle (R. F. & P.): The present rule is not applicable. There is a difference in principle that I do not understand. Take, for instance, fire damage, which involves the same principle. You card only for that portion visible when the car is under load, but here you have a case of clam-shell damage that involves a penalty on an unloading line, and it is not theirs, because the car is damaged on another line.

Mr. Fitzgerald: Is it not a fact that you are talking about interior damage not visible from the exterior? Interior damage is not cardable in interchange, but if you know you have done it, the only way you can get protection in interchange or anywhere for interior clam-shell damage is when you admit you did it, just the same as interior damage.

It is unreasonable, and I believe you will agree, when you are going to deliver equipment in interchange, if a big clam shell has broken the planks inward, you are not going to accept that car under load without protection. You don't know how it occurred, you do not have to know. The rule is clear that it was struck by something, and it is a cardable defect in interchange.

Mr. Cheadle: I understand the card covers exterior damage the same as interior.

Mr. Fitzgerald: Let us have a suggestion for a change of rule. I stood on the floor at several conventions and argued the same way.

T. J. O'Donnell (C. I. I., Buffalo, N. Y.): Do I understand the genial young man from the C. & E. I. to say interior damage is entirely a handling line or owner's defect? Supposing we get a C. & E. I. gondola and somebody has broken out six or seven planks by handling it with a shell, or loading or otherwise, and it comes to a road that is not in any way interested. The first road receiving that car will want protection.

Mr. Fitzgerald: Are you talking about a plank broken inward or outward? I am going to say that is an owner's responsibility. There is no argument; some road will admit that they did it.

Mr. O'Donnell. They have not admitted it. I am in sympathy with the chairman of the Rules Committee on the side planks or side stakes damaged on the outside or exterior of the car. The only way you can get protection from the fellow that did that is at the plant, by the first road. If he delivers the cars out he makes himself responsible when they are offered to the other fellow.

Mr. Fitzgerald: For exterior damage.

Mr. O'Donnell: How about the interior damage too?

Mr. Fitzgerald: The rule is decidedly clear in that respect. The interpretation provides you must follow back and get an admission from the road that did the damage. It is strictly up to the owner to trace that.

Mr. O'Donnell: I beg your pardon. If I am unloading cars in the Buffalo District, and I have an N. & W. or C. & E. I. car and we do not protect the owner of the car, and the car is damaged to the extent of $30 or $40 on the interior, and it is offered to the Pennsylvania by the New York Central, it is up to me to protect the Pennsylvania by protecting them with a card. I can not let the C. & E. I. or the N. & W. fight that out.

Mr. Nelson: There seems to be a serious misunderstanding. The A. R. A. formulated this rule as they did on account of the possibility of misplacing responsibility for the concealed defects. It is a well-known fact that a car with extensive clam-shell damage might be loaded and passed over one railroad with that damage, going on to another road to be unloaded, and then delivered to a third road empty. It would be very unfair to hold the intermediate carrier responsible, who had no possible way of protecting himself.

From what Mr. Cheadle said it would appear that he has misunderstood that, because it is my understanding that the fire damage rule was necessary in order to coincide with the interpretation on clam-shell damage.

The only question that was brought up here or was brought before your committee was how far you could go in carding for clam-shell damage in interchange, and our answer is that the carding shall be confined to the damage that has originated by reason of the car being struck or side-swiped from the exterior, and the same principle applies identically to the fire damage job.

Rule 33, (Sec. b) Item 2

Question: Road A tenders to road B, on Dec. 25, 1929, a twin load shipment. Car was accepted, moved, and made empty. After being so handled, car was carded to road B's shop, account missing brake staff and attachments, also coupler operating lever. Repairs were made, and car was OK for movement Jan. 3, 1930. Movement and handling was made in terminal under jurisdiction of Chief Joint Interchange Inspector, and the request was made on record above shown for defect-card protection. Chief joint interchange inspector declined protection, advising that rules effective Jan., 1930, could not be applied to interchange of equipment effected Dec. 25, 1929, prior to change in rule. Road B contends that information available would indicate that missing car parts had been removed at time of original loading, and that delivering line should be held responsible. The committee is respectfully requested to advise who would be responsible in such a case.

Opinion of Committee: The decision of the chief joint interchange inspector, at points governed by such representative, should be accepted as final.

Mr. Mehan: That is all right at points where there is a chief joint car inspector, but what about points where there is no inspector?

This was put into the rules as of a recent date, and as I understand it, he wants to make the rule retroactive, and I think he can, because the rule for many, many years held the delivering line responsible for the removal of any parts of a car to facilitate loading or unloading, and while they did not definitely single out certain parts as they do now, still, under that ruling, it was the handling line's responsibility, and I think we ought to say that and not put it up to the chief joint inspectors. Suppose you have two inspectors, one with one opinion and one with another. How are you going to decide it?

Mr. Fitzgerald: The Arbitration Committee has ruled as we have replied in a terminal so governed, and that is the question asked. If it had been put up to the committee in another way, it would have been so handled.

Rule 43

Question: Your committee's attention was called to the fact that prior to 1922, very few refrigerator cars were operated equipped with other than temporary floor racks, but since that date a majority of private line companies have applied permanent floor racks to their equipment. The application of permanent floor racks is not an obligation on the part of such owners, but they are considered an aid to refrigeration, and at the same time such application relieves the carriers of considerable expense, as in the past it was necessary for carriers to apply temporary floor racks at their own expense.

In the case of permanent floor racks which are applied, these racks are securely attached to the floor with hinges, and are part of the car. They are expensive to apply, and maintain, costing approximately $45 per car set. One owner reports as many as twenty-five car sets of these floor racks missing in one month.

Considering the expense, and the fact that these racks are essential for proper refrigeration, it is felt that some penalty should be devised so that they will not be removed, and if a railroad having car in its possession permits shipper to remove them, it is felt that the railroad should be made to bear the burden of expense, rather than the owner, as owner's jurisdiction does not extend over any of the railroads.

We appreciate that under present rules there is no provision made for reimbursement for missing or damaged floor racks. Rule 43 reads:

"Inside parts or concealed parts are at owner's risk."

This rule is quite as old as the A. R. A. code of rules and we have never taken this rule as applicable to permanent floor racks, which we consider a part of the car, and for the reason that permanent floor racks had not been adopted in general use when this rule was established. Do you consider missing floor racks as handling line responsibility?

Opinion of Committee: We feel that the question of missing permanent floor racks from refrigerator equipment warrants careful consideration. In the first place, we believe that all concerned will agree that these racks could not possibly become missing in fair service, and must of necessity be renewed if found missing. We further feel that it would be unfair to attempt to place responsibility for missing floor racks with the handling line, unless it could be shown conclusively that that particular line received the car with floor racks intact and in position, and this could not possibly be followed. For example, a car of this nature might leave owner's plant properly equipped, and operate over several lines, and at some point these floor racks might be removed to facilitate loading of some certain commodity with which floor racks might interfere. Assume then that car was again made empty and again loaded and routed over several lines, finally made empty and tendered home. If we were to recommend this item be made a cardable defect in interchange, we would then be penalizing an innocent party, as it is not generally considered good practice to open up refrigerator cars under load, and the handling line in this particular case would have no means of protecting itself.

We hope that with a thorough discussion of this important question here, railroads in general will interest themselves in this matter, to the end that the removal of these permanent floor racks will not be permitted, and, as in the case of fire damage, any road having knowledge of the fact that these racks were removed on its line should issue its defect card to cover.

A. R. Schroeder (M. C.): We have A. R. A. rules to follow, and they are quoted here in this opinion of the committee. An owner is responsible for interior parts missing. Why add this in here and start something?

Mr. Fitzgerald: We are not adding anything. We have had, from a great number of owners, complaints which should receive fair consideration on the part of the railroads. We admit it is not cardable, and it is impossible to make it a cardable defect. We do not suggest carding it. We suggest that you try to prevent the removal and go along with the good men who have appealed for help.

We are not going to boast that we have everything clean. The facts are, we had information submitted to us that we could not refute. The facts are there; we know this occurs.

Mr. Mehan: Rule 32 holds the handling line responsible for removing any part of the car to facilitate loading. If you take floor racks out you must take them out

for some reason; you usually do it to facilitate loading.

Mr. Fitzgerald: If you know they were removed on your railroad you should issue the card.

Mr. Cheadle: This is practically the same principle you have involved in the clam-shell damage. You do not know who takes the racks out. What are you going to do? You are saying somebody is responsible. How are you going to make a rule and have the same confusion you have with the clam shell?

Mr. Fitzgerald: That is exactly what the committee has said, in plain English, that a rule can not be made, but we have a rule that positively places responsibility with you if you know the floor racks were removed. We are suggesting that we police it a little. I do not think there has been enough attention given to it.

Mr. Elliott: I do not believe the Arbitration Committee could put enough rules in the book to cover conditions like that. When you take a floor rack out, put a card on the car.

J. M. Ryan (C. S. P. M. & O.): I think it would facilitate the roads' efforts in locating the car from which these are missing if the floor racks were stencilled. We have had a few cases where, at an outlying point where we have no men except an agent, when we came to clean up we found a few floor racks. We do not know what they were taken out of. The car may be thousands of miles away, may have passed several interchange points between the time they were taken out on our line and the time it reached the home line. What should we do? If we knew whom they belonged to, we could notify them that we have the racks.

Mr. Fitzgerald: Mr. Ryan, that is a very good suggestion. If you will incorporate that in a letter and send it to the A. R. A. Committee, we will be in shape to handle it, and I should like to have your remarks to use in reply to inquiries that we have received.

Mr. Rogers: I am wondering why Mr. Ryan has not instructed his agents to furnish them with some defect cards that he might put on the car from which he removes floor racks, to comply with the intent and spirit of the rule.

Mr. Ryan: Evidently Mr. Rogers has not had any experience with agents. When you try to get information from an agent, you might as well forget it, because you will not get it.

Rule 58—Pass. Car Rule 8

Question: Who is responsible for steam hose, air, or signal hose torn in two account failure to disconnect coupling?

Opinion of Committee: Treating with the question of steam hose, attention is called to Passenger Car Rule 8, section (g), and the fact that handling line is responsible for steam valve, steam train line, etc., lost with hose, and further considering the fact that a great many steam hose are so constructed as to be locked in position when coupled, and that they are not so constructed as to automatically uncouple when cars are parted, your committee, therefore, concludes that steam hose torn in two due to failures to disconnect when cars are parted would be rightfully considered handling line responsibility.

Treating with the question of air or signal hose torn in two account failure to disconnect coupling, all air and signal hose are designed and so constructed as to automatically uncouple without the necessity of parting by hand; therefore air or signal hose torn in two under such conditions would be car owner's responsibility.

Mr. Truesdale: We have, in the district I represent, many express refrigerator cars interchanged during the year, in the winter as well as in the summer. Of course, we realize the steam hose will not be connected in the summer, but they will be in the winter time.

How are we to know when the car is delivered whether the steam hose burst from steam pressure or was torn in two? You are putting a stiff proposition up to an interchange inspector with the contention you have made. If I am called upon to issue a defect card for steam hose torn in two, I do not know whether the steam hose burst in two or whether it was torn off. I do not think that contention should be accepted.

Mr. Fitzgerald: If you will recall, in reading the question it was clearly put up to your committee that there was knowledge to the effect that the steam hose had not been uncoupled, and under those circumstances we do not say there is a rule for it either. We feel if you know you tore the steam hose off in handling, due to failure to uncouple, it is a handling line responsibility. That was the question put to us.

Mr. Truesdale: You feel then, that the delivering line should apply the defect card, but the receiving line should not call upon the delivering line for protection after they have received the car, not knowing positively that the steam hose was not disconnected and that that was the cause of the failure of the hose?

Mr. Mehan: I think what Mr. Truesdale is getting after is in the case of a leaky hose. That would not mean a torn hose, but, as I get your point, it is a case where the hose is pulled off the nipple, and the nipple is still in the steam train line.

When that car comes in in interchange, the question arises whether the hose was blown off from steam pressure or whether it was pulled off by reason of failure to uncouple the couplings at the time of uncoupling the cars.

Mr. Truesdale: I have seen steam hose that were blown in two from steam pressure that were not necessarily blown off the nipple. If you fail to uncouple a steam hose you will not necessarily pull it off the coupling. You may break it in two in the middle.

This car may be delivered to the receiving line, and he may ask for protection, claiming this hose was not uncoupled before the car was uncoupled, which was the cause of the steam hose breaking in two, and may call upon me for protection. I am not going to issue it to him, because there is nothing in the rules to say I should.

President Wymer: I think you are off the discussion of the question. The question was not asked about that case. The question said, "on account of failure to disconnect coupling." That is all that is up for discussion, and as the chairman of the committee said, it is a case where you know it was torn off through failure to uncouple. The other question is a side issue; they have not answered that at all.

Mr. Mehan: When a car comes into an interchange point with the hose pulled off the nipple, what is the interchange inspector going to assume, that it was pulled off by failure to uncouple the hose, or was it blown off by reason of being insecurely attached to the nipple?

You say where it is pulled off due to failure to uncouple that that is a handling line responsibility and cardable. If you get a condition where the hose is pulled off and gone with the coupling, but the nipple is in the train line valve, what are you to assume? The torn hose is an isolated case, but I can see where a hose torn off the nipple would create some question, and I think perhaps that ought to be referred to the Arbitration Committee.

Mr. Truesdale: The point I was trying to raise was, how the interchange inspector would know the hose was torn due to failure to uncouple. He does not see the car uncoupled. How does he know the failure of the hose was due to the failure of someone to uncouple it.

Mr. Fitzgerald: If I give you a car with a burst steam hose, you can take the car, but if I know the steam hose was torn off due to failure to uncouple, I am go-

ing to give you a defect card, and if the steam hose is missing, Sec. G of Rule 8, Passenger Car Code, handles that.

Mr. Mehan: That is a hose complete. Here is an incomplete hose, in that the rubber and coupling are gone, but the nipple is not gone.

Mr. Owen: This question was not presented from an interchange point of view. The question is, if you tear a steam hose off due to not uncoupling it in your switching, are you responsible for it? Now the answer does not say that it is cardable at interchange, because when it comes to interchange you do not know how it was torn or burst or pulled off. It does say if you have knowledge that you tore the steam hose off due to neglect to uncouple it, you should be responsible for it.

I do not see but that is plain, and I do not think a man in the room would say the owner should be responsible for tearing a steam hose in two because the handling line neglected, and knew they neglected, to uncouple it.

Mr. Elliott: That is another case where you are not handling it according to A. R. A. Rules.

E. S. Swift (Wabash): I think it would be a good idea to add, "provided the car was not on the owner's rails between the two dates." That changes the entire responsibility. The second road does not act in joint evidence if the car has been on the owner's rails between the two dates.

President Wymer: It has been moved and seconded that the addition to the question suggested by Mr. Swift be made. All in favor signify by saying "Aye." Contrary, "No." (The motion is carried.)

Secretary A. S. Sternberg: I move that the report of the A. R. A. Committee be approved with the few corrections made, and that we extend to them a rising vote of thanks for their excellent work, and that they be continued for another year.

F. A. Starr (C. & O.): I second the motion.

(The motion was carried with a rising vote.)

The report of the A. R. A. Committee was signed by M. E. Fitzgerald (chairman), general car inspector, Chicago & Eastern Illinois, Danville, Ill.; J. Matthis, Jr., general car inspector, Wabash, Decatur, Ill.; W. J. O'Brien, superintendent of car department, Terminal Railroad Association of St. Louis, E. St. Louis, Ill.; O. H. Clarke, supervisor of car repair billing, Gulf Coast Lines, Houston, Tex.; George Burbie, chief car inspector, Swift Transportation Company, Chicago; F. A. Isaminger, superintendent of car equipment, Roxana Petroleum Company, Wood River, Ill.; C. J. Nelson, chief interchange inspector, Chicago Car Interchange Bureau, Chicago; W. R. Owen, chief interchange inspector, Peoria & Pekin Union, Pekin, Ill.; J. E. Mehan, assistant superintendent of car department, Chicago, Milwaukee, St. Paul & Pacific, Milwaukee, Wis.; H. A. Sigwart, supervisor of car-repair billing, Missouri Pacific, St. Louis, Mo., and W. R. Rogers, chief interchange inspector, Youngstown, Ohio.

Traveling Engineers Convention

(Continued from page 627)

used threads on the pipe are exposed. Breakage of this kind is almost solely due to vibration and can be largely overcome by proper bracketing.

Allow for Expansion of Piping—Eliminate Pockets

Wherever possible, long radius pipe bends should be used to introduce an element of flexibility into the piping system. Few people realize the amount of expansion that must be taken care of in the steam piping of a modern locomotive. Assuming that the application of pipe is made at normal temperature of 70 deg., we find that steam pipes carrying superheated steam at 600 deg. will expand at the rate of 5.1 in. per hundred feet.

It has been noted under the subject of proper location of valves that, wherever possible, valves should be located at the highest point in all pipe lines in order to avoid the detrimental effect of condensation which accumulates above the valves when they are closed. It is also desirable to avoid pockets or low points in all pipe lines because such pockets tend to collect condensation which may cause trouble during severe weather through freezing. In all cases where pockets are unavoidable, suitable provision should be made for complete drainage by installing drain valves.

The report was signed by Chairman A. T. Pfeiffer, road foreman of engines, New York Central, Syracuse, N. Y.; F. W. Venton, Crane Company, Chicago; H. J. Nottage, road foreman of engines, Union Pacific, Cheyenne, Wyo.; R. A. Phair, master mechanic, Canadian National, Montreal, Que., and R. M. Long, supervisor of air brakes, Pittsburgh & Lake Erie, McKees Rocks, Pa.

Heavy 2-10-4-Type C. & O. Locomotives

(Continued from page 619)

Pipe fittings	Crane
Radial buffer	Franklin
Running boards	Jos. T. Ryerson & Son
Uncoupling rigging	Union Metal
Valve stem packing	M. B. Brewster
Tender:	
Axles	Standard Forgings Co.
Boxes, journal	Symington
Coupler yoke	Buckeye
Drawbar, engine and tender	Unit Safety
Drawgear, tender	Waugh
Frame, tender	General Steel Castings
Hose, feed water	Goodyear
Rivets	Bourne-Fuller
Sprinkler, coal	Franklin
Springs, truck	Railway Steel Spring
Tank valve	Wm. Powell Co.
Truck, brake	Simplex clasp
Truck, tender	General Steel Castings
Uncoupling rigging	Union Metal Products

heater. The driving journals are lubricated by Franklin spreader-type grease cellars. A hydrostatic lubricator in the cab supplies the booster and the stoker. The rod bearings are lubricated by grease.

Alemite fittings are applied for the lubrication of such parts as the shoe and wedge faces, foundation brake rigging, engine and tender drawbar engine truck, spring rigging, stoker, etc.

The Tender

The tender is of rectangular design, having a capacity for 30 tons of soft coal and 23,500 gal. of water. Its large capacity makes it possible to operate these locomotives on long runs with comparatively few stops for fuel or water. The tender trucks are of six-wheel design and are arranged for the future application of train control. The tender frame is of the General Steel Casting's cast steel water-bottom type arranged for radial buffer and Unit type drawbar.

The boiler jacket, outside of the cab, sand boxes, outside of the wheel centers and the tender are finished in black Ripolin, which gives an attractive appearance to the locomotive.

Lentz Poppet Valves for Locomotives

By F. Johnstone Taylor
Cardiff, South Wales

THE shortcomings of the slide and piston valves for locomotives have long been recognized. Their almost universal use is due to the simplicity and convenience of the link motion in effecting the necessary reversing and cut-off adjustments. The evolution of such a system which could be applied to poppet valves, without undue complication, has occupied the attention of many locomotive designers for a number of years.

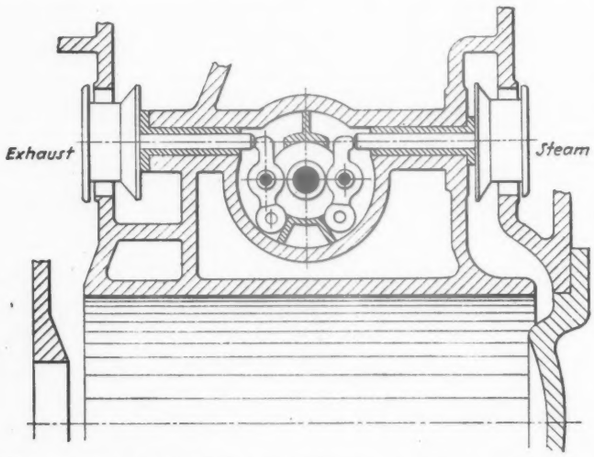


Fig. 1—Sketch showing the operation of the Lentz-Dabeg poppet-valve gear

Two designs of poppet valves appear to have achieved some measure of success. One is the Caprotti gear which was described in the March, 1927, issue of the *Railway Mechanical Engineer*, page 142. This gear is now extensively used on Italian State Railway locomotives and is also installed on two British locomotives. The other gear is of Austrian origin, generally known as the Lentz. This gear was recently applied to a three-cylinder express-passenger locomotive on the London & North Eastern in Great Britain. The same type of gear, now manufactured by Dabeg, is applied on a 4-6-2 type locomotive on the Delaware & Hudson.

Movement of the Valves

The relative movement of the valves is illustrated in the sketch, Fig. 1. This sketch shows the operation of one of the two steam and one of the two exhaust valves of each cylinder. Intermediate levers fitted with rollers which bear against the cam profile are located between the cams and the valve spindles. This arrangement permits the use of light spindles and a large port opening, both important considerations. The intermediate levers are pivoted on fulcrum pins carried in a circular cast-iron housing which is also provided with bushings for the support of the cam-shaft bearings.

Referring to the cross-section in Fig. 2, the necessary drive is obtained through a bevel gear which is not shown on the drawing but is located on the extreme right. Located near that position is an arrangement which permits of the rotation of the cam shaft by means of a driving dog, but at the same time allows the shaft to be moved axially for the purpose of reversing the locomotive.

Reversing the Locomotive

If this valve system were applied to a simple non-reversible locomotive, what has been described would suffice for the purpose. But in this particular case, the reversing system is the most important feature of the mechanism, as it must enable the engineman to reverse and hook up in the same way as is necessary with any link motion. The gear as shown is applied to three single-expansion cylinders. A portion of the cam shaft is fitted with a rack between the center cylinder and the one on the left. The cam shaft can be moved an appreciable distance backwards or forward with the reversing wheel in the cab by means of the engaging pinion which is connected by a shaft with the reversing wheel. It is by this means that the different cams shown in Fig. 2 can be engaged with the cam rockers.

Actually the steam-inlet cams for each cylinder are made in two separate sections. Those for forward-gear running provide for five different rates of admission from a minimum cut-off of 15 per cent to a maximum of 75 per cent in full gear. For running backward, an additional set of cams is provided which gives two rates of admission, one for full gear and the other giving a shorter rate of cut-off of 35 per cent. In addition, a

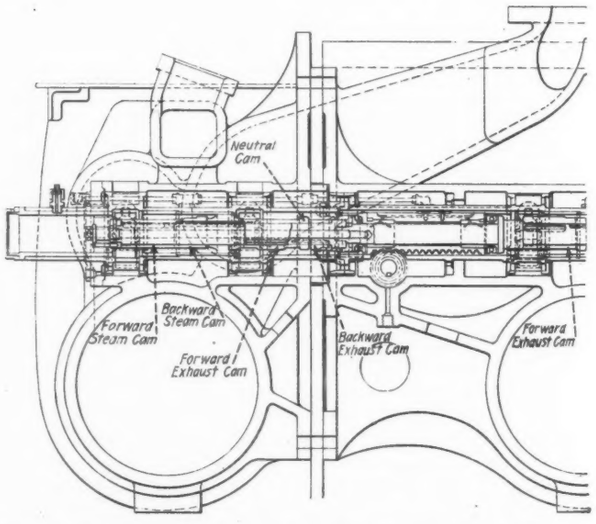


Fig. 2—Cross-section showing the application of the Lentz-Dabeg gear

cylindrical cam is provided for each cylinder for the purpose of closing the steam valves when the engine is placed in mid gear. When in this position, the exhaust valves are held open by a similar cam of larger diameter in the exhaust set. The exhaust cams are somewhat similarly arranged, except that only three different profiles are provided. They are designed in such a way that when the engine is in full gear the point of compression starts later than is the case with the shorter admission rates.

It will be seen, therefore, that by rotating the hand wheel in the cab, the transverse movement of the cam shaft will bring any required cam into contact with the rollers on the intermediate levers shown in Fig. 1 so that the cut-off may be adjusted by hand and the locomotive reversed. In addition, ample by-pass is provided with the gear in mid position, the steam valves being closed and the exhaust valves opened.

EDITORIALS

Modernizing a Small Terminal

AN excellent illustration of the economic value of installing modern labor saving equipment will be seen in the description of the facilities at the Bay City, Mich., terminal of the Grand Trunk Western which will be found on another page in this issue. There are undoubtedly many similar locations on the roads of this country where there will always be a certain amount of traffic which will require the handling of locomotives at outlying points. At such points, too, as a rule, the amount of traffic or the prospects for future traffic are such that a large force of men is not warranted yet it is necessary to perform certain important work in order to operate the terminal. The Bay City terminal problem was solved in an economical manner by the installation, at moderate cost, of coal and ash handling equipment which would permit one man to perform these arduous tasks with a minimum expenditure of time and labor and so reduce the actual daily operating cost of the terminal to an almost irreducible minimum. Undoubtedly there are many terminals at outlying points on many roads at which the operating costs could be materially reduced by a study of the conditions and the installation of adequate labor-saving facilities.

Higher Speeds Proposed

THE case for higher speeds in locomotive service and train operation was ably presented at the recent convention of the Traveling Engineers' Association in Chicago. Average train speeds have had a substantial upward trend for a number of years and the indications are that, if the railways are to meet competition on the highways and waterways and in the air, still further substantial improvements in service, including increased speed, will be required. John E. Muhlfeld, consulting engineer, New York, in the meeting referred to, said: "Automobile speedway records will now average, for runs of 5 to 10 miles, between 150 and 160 m.p.h., and, for runs of 10 to 300 miles, between 135 and 140 m.p.h. No one but the traffic officer thinks anything of driving an automobile on the regular highways at 60 m.p.h. Is there any reason why trains, operating on tracks, should not double that speed? Having operated saturated steam locomotives many years ago at speeds of 85 m.p.h., I would answer 'No,' provided we have a suitable roadway with low grades and light curvature over which to run. I think I recognize several locomotive engineers in this gathering who would be willing to tackle the job, even though they may be in their late thirties."

T. W. Demarest, general superintendent of motive power of the Pennsylvania, Western region, expressed the opinion that motive power of the future must meet increased speed requirements, and schedule speeds of 90 m.p.h. with 1,000-ton passenger trains and 60 m.p.h. with 5,000-ton freight trains may be anticipated. In the case of the passenger equipment operating on scheduled speeds of 90 m.p.h., maximum speeds well over 100 m.p.h. must be attained. Many problems are involved in the operation of trains at such speeds, not the least of which is the provision of brake equipment which will dissipate the tremendous amounts of energy involved without damage to the equipment and within reasonable stopping distances. Efficient and reliable locomotives with great reserve boiler capacity are, of course, a fundamental requirement. Lubricating problems will have to be solved. Car equipment, roadway, signaling and dispatching methods—all will have to be keyed up for the high-speed operation, in the interests of safety and reliability which are now and always must remain the first consideration. It can hardly be questioned that the present situation confronting the railroads constitutes a challenge to the designers of all classes of equipment, apparatus and appliances used in railway operations if the steam railway transportation machine is to meet the demands of the future.

The Perfect Freight Car

I *DON'T* suppose there is a perfect freight car in existence, except, perhaps, the one designed by each particular road. If we could take the dimensions that would be most acceptable to all shippers, I believe that all the railroads could use the resulting car." This statement is quoted verbatim from the abstract of an address by T. C. Powell, president, Chicago & Eastern Illinois, at the recent convention of the Car Department Officers' Association, Detroit, Mich., as it is reported in the September, 1930, issue of the *Railway Mechanical Engineer.*

Doubtless many mechanical-department officers consider the A. R. A. standard freight cars as representing the *perfect* car. However, Mr. Powell has this to say about the standard single-sheathed and double-sheathed box cars: "The only difference between the two as to the inside dimensions is in the width, the recommended specifications for the standard double-sheathed box car having resulted in an inside width of 1¾ in. greater than the inside width of the standard single-sheathed box car." He points out that perhaps this difference may have been accidental, but no car has been constructed in the last ten years to the exact inside dimensions of either the standard single-sheathed or double-sheathed box car.

Mr. Powell discussed this subject from the standpoint of the traffic department which, as he said, looks upon freight and passenger cars as conveyors or containers for revenue traffic. It feels that the best combined judgment should be exercised in providing the best container for the purpose. A car, he said, which, because of its design or lack of consistent design, increases the cost to a shipper or increases the cost of handling on a foreign railroad, or which causes unnecessary and profitless empty haul, is worse than a crime; it is a blunder.

There is no doubt but that there has been a lack of coordination between the traffic and mechanical departments in the design of new freight-car equipment. Apparently there has been better cooperation between the two departments in the matter of purchasing new locomotives. Practically all of the new power which has been ordered in recent years has been to facilitate the hauling of greater tonnage at increased speed, and at a lower cost to the railroad. On the other hand, according to the study made by Mr. Powell and if we

accept his conclusions, freight cars have been designed primarily to facilitate maintenance, perpetuate standards and reduce loss and damage claims.

It can be said, in partial answer to Mr. Powell's arguments, that the mechanical department and the car manufacturers are not entirely to blame for the present situation with respect to the large variety of freight cars in existence. Few traffic departments appear to know what they want. There are many shippers who also insist that their products require cars of special design and most railroads consider it good business to give these shippers the kind of cars they want. Witness the development of the 65-ft. gondola for the steel shipper and the wide-door box car for the automobile manufacturer.

This is not the first time that the wide variety of inside dimensions, especially in box cars, has been questioned. The attempt to develop a standard loading skid for use with lift-platform trucks, which was sponsored by the Department of Commerce several years ago, struck a well-nigh insurmountable obstacle when the several working committees endeavored to develop a standard skid, the dimensions of which would permit the most economical loading of a box car.

The constructive suggestions in Mr. Powell's address merit the investigation of the A. R. A. Committee on Car Construction. In all probability the Committee on Loading Rules can be of considerable assistance, because of its knowledge of the loading problems of the shippers. Such a study will also necessitate the cooperation of traffic-department officers and shippers. Mr. Powell has made a real contribution to the railroad industry in bringing up this subject as he has. The study he has so ably started should be taken up by the A. R. A. and continued.

The Future of the Associations

AT the present time there are nine national associations made up wholly or partially of supervisors connected with the mechanical department and dealing with subjects of interest to that department, none of which is dealt with in detail by the Mechanical Division. With the exception of one (the Equipment Painting Section, Mechanical Division), they are all voluntary associations without official connection with the American Railway Association. Six of them are organized along craft or sub-department lines, each consisting of a group of supervisors dealing directly with a specific department of equipment maintenance. One (the Air Brake Association) deals exclusively with a single feature of car and locomotive operation and maintenance and two (the International Railway Fuel Association and the Traveling Engineers' Association), with various problems of locomotive operation, their consideration of maintenance being in its relation to operating results. Every one of these organizations came into being to meet a need of the men in the group making up its membership in their efforts to promote improvements in the technique and economy in the operations for which they are responsible.

Aside from the members of these associations themselves, two groups are interested in their future performance and in seeing them developed along lines which will produce the greatest effectiveness with the least expenditure. These are the general officers of the mechanical department and the companies which exhibit their products during the conventions. Both of these groups wield a large influence on the success of the conventions—the railroad officers by the extent to which they encourage and finance the attendance of their men at the conventions and the exhibitors both by the character of the exhibits and the entertainment which they sponsor.

From time to time the question has been raised by both of these groups as to whether the expense of holding so many conventions is justified. The effectiveness of at least some of the associations has been questioned.

A proposal is now being brought before six of these associations that they meet in relays of three each during two consecutive weeks in the spring, the memberships of the three associations in each group enjoying a common exhibit and common entertainment features. The interests represented in the associations in each group suggest the possibility of an extensive exhibit of locomotive appliances and shop tools and facilities covering most of the departments of the locomotive repair shop and engine terminal.

This scheme may affect the three groups interested in the associations in somewhat different ways. For a fairly large group of exhibitors of locomotive appliances it is probably the nearest practicable approach to an ideal situation which can be developed. An analysis of past exhibits indicates that this group is interested in three of the conventions—those of the Traveling Engineers' Association, the General Formen's Association and the Fuel Association. The number exhibiting at the other three organizations—the Tool Foremen's Association, the Boiler Makers' Association and the Master Blacksmiths' Association—who are interested in more than the one association is relatively small. There may thus be some question as to the value of an exhibit lasting throughout the two periods to most of these exhibitors.

Considering the matter from the viewpoint of the officers generally responsible for equipment-maintenance operations, it may be questioned whether an arrangement which calls for the simultaneous absence from their posts of duty of two or three subdepartmental supervisors or foremen will be regarded as entirely satisfactory. Furthermore, certain supervisors are interested in the work of more than one of these associations. In some cases this will require their continued absence during the most of two weeks if their interest in more than one of the organizations is to continue. This may offer difficulties.

Coming now to the interests of the members of the various associations themselves, the proposal will undoubtedly offer the advantage of a more extensive exhibit, although in the case of some of the departmental foremen many of the exhibits will be of only casual interest. It may be questioned whether the enjoyment of common entertainment features will be an unmixed blessing. No small part of the value of the conventions comes from the personal contacts and opportunities for intimate discussions of mutual problems outside of the convention hall. Will the large and more heterogenous grouping effected by common activities outside of the convention halls promote or interfere with the best development of this important benefit of convention attendance?

The decisions which must be made by the various associations with respect to this proposal are difficult ones and many factors must be considered. One thing, however, is clear. The primary purpose of these associations is neither to view exhibits, however educational they may be, nor to be entertained, however valuable the entertainment may be in promoting attendance. The primary purpose of these organizations is, through united effort and interchange of ideas as to

methods and practices, to improve the efficiency and economy of railway equipment operation and maintenance. How each association can best promote these ends within its own field is a matter which the executives and members of the association must decide for themselves. Future success will depend in the greatest measure on the vision with which the associations grasp the opportunities which the needs of progress in their respective fields offer them.

Safe Handling of Cars with Dangerous Lading

THE regulations regarding the transportation of explosives and other dangerous articles, as prescribed by the Interstate Commerce Commission, are formulated only after extensive conferences with both the carriers and the shippers and, hence, are not only binding on both parties under the federal law, but are generally acceptable as being in the best interests of all concerned. In view of constantly changing conditions, these rules require frequent amendments and, in order to avoid the confusion of numerous supplements, a complete revision of the regulations was made effective and published October 1 of this year. The new book of rules is already proving popular, a feature particularly appreciated being the inclusion of all the principal rules affecting the carriers and their employees in a single section, designated as No. 4.

The administration of the I. C. C. regulations governing the transportation of explosives and other dangerous articles is in the hands of the Bureau of Explosives which began active work in 1907 and has since not only served as an effective inspection and enforcement agency, but has functioned along educational lines as well on the theory that if a shipper knows what must be done to prepare articles for safe transportation, if railway employees understand safe handling practices and supervisory officers are familiar with the requirements and enforce the rules, satisfactory results of this co-operation will be sure to follow. In line with this educational work as applied to railway employees, the bureau issues not only complete regulations and specifications covering movements of dangerous commodities in freight, express and baggage service, but pocket-size pamphlets containing the rules as applying to particular classes of employees, so that a car inspector for example, will have only the rules which affect his particular duties in complying with the regulations. In this way, the attempt is made to provide in simple form to the various classes of railway employees the information necessary for the proper performance of their duties as laid down by the regulations.

Records for the past 23 years show the gratifying results of this educational work. According to W. S. Topping, assistant chief inspector, Bureau of Explosives, in an address before the Car Department Officers' Association at Detroit, Mich., last August, there have been no serious accidents in the transportation of explosives for the past three and a half years, such minor accidents as have occurred being caused by explosives used in connection with fireworks. In the transportation of "other dangerous articles," Mr. Topping says that the record is not so good, the outstanding material to give trouble, so far as the number of accidents and total property losses are concerned, being gasoline. There were 380 accidents in 1929, five persons killed and eight injured, the aggregate property loss being $606,166 chargeable to gasoline. Between 1910 and 1928, there were 165 fatalities, 811 injuries and a property loss totaling $8,592,085. While this loss was all due to improper practices in the transportation of gasoline, other dangerous articles, such as acids or corrosive liquids, poisonous gases and liquids, contributed their share to the record of accidents, injury and property damage.

The records indicate that wrecks or derailments are the prime causes of most of the losses mentioned. Broken rails, broken wheels, falling brake rigging, broken arch bars, dragging brake beams, errors in switching, application of brakes on curve, uneven track, faulty drawbars and broken air hose are all given as causes of these derailments, which reflect an undesirable condition of roadway, car equipment and operating conditions. Car department officers owe it to themselves and to their railroads to check with redoubled caution the condition of all cars submitted for the handling of explosives and other dangerous articles so that these cars can be given expedited movement and their dangerous lading removed from railway property with the least possible delay.

Not only is it essential to take particular care in the handling of these cars containing dangerous materials during their movement over the line of road but, in many cases, equal caution is required after the cars have been unloaded. Car men are generally familiar with the potential danger in the handling and repair of empty tank cars which have formerly contained inflammable materials, for example. In spite of the utmost care, accidents continue, however. In one case, Mr. Topping reports that "Car repairers were supplying new draft bolts in one end of a car containing sulphuric and nitric acids, and the leakage from some broken carboys was not observed. After completion of the repairs, the car was again put into service and subsequently discovered on fire. Leakage of nitric acid is sufficient to cause a fire." In another case, "A tank car which had previously been used for the transportation of naphtha was being repaired. A boiler maker and his helper were replacing rivets, and a red hot rivet was passed to one of the employees inside the car. Ignition of the inflammable gases occurred, killing one employee and seriously burning another. This particular car had been empty for 17 days prior to the accident but had not been cleaned." In still another case, "An employee entered an empty gasoline tank car alone. He was overcome by gasoline vapor and was found dead later. The vapor, even without ignition, is dangerous." The leakage of poisonous articles from their containers in cars must be guarded against and the cars thoroughly cleaned subsequent to removal of the lading. In one instance, a car originally loaded with arsenic in barrels was used for lumber service and afterwards for the loading of grain. The contamination of the grain by a certain amount of arsenic which leaked from the original containers onto the car floor is said to have caused the death of a considerable amount of live stock, although the grain moved several months after the original lading had been removed.

These few instances serve to emphasize the importance of the work which the Bureau of Explosives is doing in disseminating information regarding safe practices in the transportation and handling of explosives and other dangerous articles. Both the railroads and the shippers have co-operated with the bureau in this work in the past, but maximum results cannot be achieved until mechanical department supervisors and employees lend their complete and hearty support.

THE READER'S PAGE

A Word of Commendation

FOXBURG, PA.

TO THE EDITOR:

I have been a subscriber to the *Railway Mechanical Engineer* for some time and it surely is a great help to any car foreman. The article in the June issue entitled "Modernizing a Car Repair Shop" was of especial interest to me. Mr. Carson hit the nail on the head. I can readily see that he is an up-to-date car foreman. A number of short steps set forth in Mr. Carson's article are worthy of consideration by any car foreman.

A CAR FOREMAN.

Which Man Would You Hire?

NEW YORK.

TO THE EDITOR:

Business conditions are slowly returning to normal. However, many men who were laid off or discharged during the depression are now looking for jobs. Suppose you are the head of the mechanical department of some railroad and you have a vacancy on your supervisory staff. Two men with the same qualifications and experience apply for the position. One man, however, is a member of a foremen's association and the local railroad club. The other has never been a "joiner." Which of the two men would you employ?

If the vacancy was on your engineering staff, would you give preference to a member of the A.S.M.E. or some other technical society of similar standing?

A JOB HUNTER.

An Indian Experiment with Air-Cooled Cars

GALVESTON, TEXAS.

TO THE EDITOR:

The artificially cooled passenger cars now being experimented with in the United States are being widely heralded as the first of their kind in the world. During the summer of 1929, French papers also chronicled the advent of the first "refrigerated railway carriage" on the Paris-Orleans.

Long before this, however, an interesting experiment had been made in India, a country of long distances and diabolical summer temperatures. The Great Indian Peninsula Railway was one of the most progressive lines in India, and it was on that railway that an entire train was equipped with cooling apparatus in the early summer of 1914. A carbon-dioxide refrigerating plant was installed in the baggage car, and cold brine was piped through the train from this plant. Arrangements for controlling the temperature and circulation of air were provided in the cars.

It was found easily possible to maintain an interior temperature about 20 deg. F. lower than the outside air, but two serious objections manifested themselves. First, considerable condensation of moisture occurred from the excessively humid air. This might have been overcome had it been possible to continue the tests to a conclusion. Secondly, and more important, the great majority of passengers preferred to endure the natural heat rather than undergo the sharp changes of temperature on entering and leaving the train.

The outbreak of the World War in August, 1914, brought this experiment to an abrupt end.

WM. T. HOECKER.

More about the Starting Power Lever Discussion

TOPEKA, KAN.

TO THE EDITOR:

Being the inventor of the starting power lever under discussion on pages 576 and 577 of the October, 1930, issue of the *Railway Mechanical Engineer,* I would like to make the following comments. The starting power lever is designed with the upper pin in a vertical line above the fulcrum pin. The middle pin is set back of the vertical line to make approximately right-angle center lines with the radius rod when the link block is in the center of the link.

Referring again to the pin at the upper end of the starting power lever: The combination lever, which is designed to give the desired amount of lap and lead, will usually locate the pin at the bottom end of the combination lever directly in line with the piston rod so that the pin cannot be removed. This necessitates making the combination lever longer so that the pin can be removed beneath the piston rod. With the pin in this location, the angle between the combination lever and the union link is disturbed, resulting in unequal leads. This error is corrected by choosing a location for the pin at the top end of the starting power lever slightly above the pin at the top end of the combination lever. The correct relation of these pins will provide equal leads at all points of cut-off.

F. H. BENTON

Hard Riding Coaches

ROSELLE, N. J.

TO THE EDITOR:

Hard riding of coaches, discussed in letters appearing on the Reader's Page of the April and July issues, is a live question in view of present-day competition. Easy-riding passenger coaches should assist considerably toward inducing motor-bus passengers to ride trains.

The hard-riding coach causes eye strains, irritates and evokes criticism. It is, therefore, of first importance to eliminate such hard-riding cars from the service as "undesirables" until the shop forces have "cured" them of their ill behavior.

A large number of modern steel passenger cars with four-wheel trucks are in service on American railroads which ride comfortably at speeds of less than 60 m.p.h. but with an increase of speed to 60 m.p.h. or over show a tendency to sway, roll and bounce, more or less, so

that their behavior is bordering close on hard or rough riding.

Roller bearings do not seem to improve these conditions. In fact no difference can be noted at such speeds between roller bearing and non-roller bearing cars of the same general construction. At a speed of 60 m.p.h. or over, the noise produced by couplers, diaphragm plates and buffer stems when the train is passing around curves often produces an imaginary feeling among the passengers of hard riding. To reduce or eliminate as much noise as possible under and between cars will help to increase the comfort of passengers and advertise the train as one of superb riding qualities.

It would also seem there is need of a device to check the excessive swaying of the car body at high speeds. Automobiles are using snubbers and various kinds of shock absorbers. Perhaps specially designed snubbers could also be used between truck and body bolsters to steady the up-and-down movement, and sudden leanings of the car body.

CARMAN.

Further Discussion of Our Imaginary Car Shop

CLEVELAND, OHIO.

TO THE EDITOR:

I note with considerable interest that H. K. Allen does not entirely agree with my remarks in the August issue of the *Railway Mechanical Engineer* wherein I took some exceptions to the necessity of spending a million dollars to secure some increase of output such as he proposed to do in his model car shop.

The first point that I would like to make clear is that I am not opposed to a progressive system of car repairs. I believe, however, that the progressive plans have been greatly overrated and I also believe that on a properly organized job of repairs that the movement of men is as efficient and as economical as the movement of cars. The movement of men gives a much more flexible plan of operation where the repairs to the cars are not exactly the same on each car in the line-up on the track.

If there is a possibility of delay to the track movement it is usually the practice to place floating gangs at strategic points to help take up the slack and keep the track moving; when the men are moved it is often possible to get along without this gang and thereby reduce the labor costs. It is understood that any delay on the track holds up all work back of that point, and often in front as well.

It is possible that I am behind the times; that point is debatable. The fact remains that there are a number of large car-repair plants that always repaired cars on a man-movement plan as the most economical method when repairs were not the same on each car.

The U.S.R.A. hoppers I mentioned in my previous letter involve the removal and application of about 1,600 rivets per car. This will give any experienced car-department supervisor an idea of the amount of work involved. The sand blasting is performed at one location, as Mr. Allen will note if he reads my previous letter more carefully. The scrap is loaded on scrap cars by the strippers; usable material is loaded on trailers by the strippers and sent either to the straightening shop or the repair track, two supply men in addition to the tractor operator performing this work. The 14 car men and apprentices pack the boxes and also heat and buck the rivets. The sills are handled by hand by the car repairers (all material, both new and old, is piled adjacent to the repair operation) and one painter and helper sand blasts these cars together with some others that are being repaired in the same shop. A part-time air-brake man does the air-brake work.

The figures furnished are fairly reliable even if furnished by a comedian. For the restricted space available a progressive movement could not be used nor would it be any more efficient if it were used.

No advantages can be claimed through the fact that the work is performed in the open. However, the output of 1.2 cars per day is the average output and were the shop enclosed it would be higher. I merely mentioned the fact that work was performed in the open to compare the conditions with Carson's open-air condition so it will be granted that an enclosed shop is more desirable.

With reference to the 750 composite hopper cars—the rebuilding of those cars happens to have been described in an article which was published on page 27 of the January, 1928, issue of *Railway Mechanical Engineer* in which will be found the details of the movement of men and the layout of the shop.

Like Mr. Allen, I am anxiously awaiting some letters from other car department people. I believe that the majority of experienced supervisors will agree with me that Carson overlooked a lot of opportunities to improve the old shop operation before he got his "modernized repair shop."

C. E. LOYD.

Points To Remember about Wheels

SPARTANBURG, S. C.

TO THE EDITOR:

New cast-iron or cast-steel wheels should not be mounted on A.R.A. standard axles having wheel seats ⅛ in. or less in excess of standard diameter for applying under foreign cars. If they are so mounted, the repairing line will lose the difference between new and second-hand value of the wheels applied. Also, if such axles have wheel seats ⅛ in. or more in excess of the standard diameter, the repairing line will lose the entire value of such wheels. Such A.R.A. standard axles with wheel seats ⅛ in. or more in excess of standard diameter may be selected for mounting wrought-steel wheels of 60,000 lb. and 80,000 lb. capacity with standard axles having 4¼-in. by 8-in. and 5-in. by 9-in. journals and the repairing line can charge the car owner for the value of the wheels applied in case of owner's responsibility.

It is also very important in selecting second-hand cast-iron wheels for remounting to see that the nominal weight as shown in Rule No. 83 is complied with; that is, wheels cast after June 30, 1924, must not be less than 650 lb. for 60,000 lb. capacity cars, 700 lb. for 80,000 lb. capacity cars and 750 lb. for 100,000 lb. capacity cars and, on and after January 1, 1931, irrespective of the date, these figures must be adhered to. The wheel-shop employees whose duty it is to press wheels off and on should be well versed in A.R.A. rules as pertains to the handling of wheels if they expect to handle their jobs to the best interest of their railroad.

W. H. SHIVER, A.R.A. Clerk
Southern, Hayne Car Shop, S. C.

With the Car Foremen and Inspectors

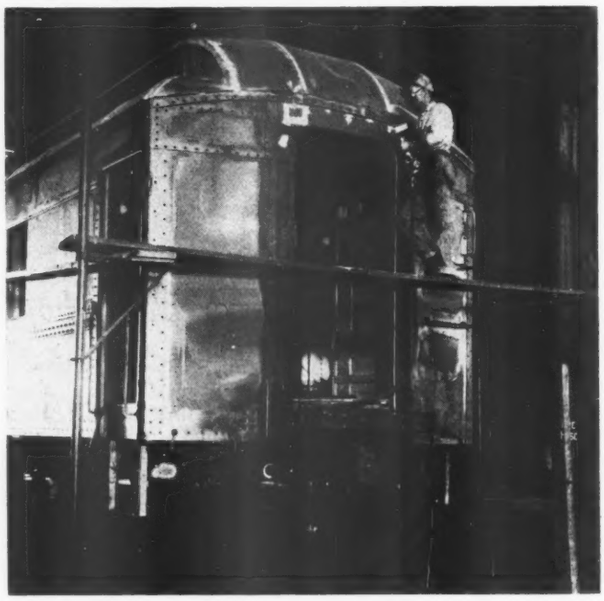
Frisco Builds New Passenger Cars

THE St. Louis-San Francisco has recently been engaged in changing over and rebuilding 11 diners and 7 cafe-lounge cars on such an extensive scale as to constitute the equivalent of new cars. This work was handled at the Springfield, Mo., shops of the Frisco by progressive specialized gangs in three stages; namely, body work (including the construction of all kitchen and dining-room or lounge-room details), application of interior trim and decoration, and painting.

The old dining cars, out-of-date and badly corroded, especially under the kitchen, were completely rebuilt from the sills up, involving approximately 80 per cent new work. The design was changed to provide different window spacing; the kitchen and pantry layout altered; a side door applied and the underframe strengthened. Ascoloy stainless steel was used in the kitchen, in all ice-boxes and in the kitchen side walls up to the deck. Outside Gothic sash was removed and a wide letter-board applied. Veneer panels in the dining-room were made at the Springfield shops, comprising two tones of canary and buff to match the amber-colored mahogany trim. The Agasote ceiling and upper deck were finished in white. All inside finish was applied with paraffin paper in between and behind all panels and moldings, with screws to permit easy removal and prevent squeak. In fact, the entire car structure was designed for maximum rigidity.

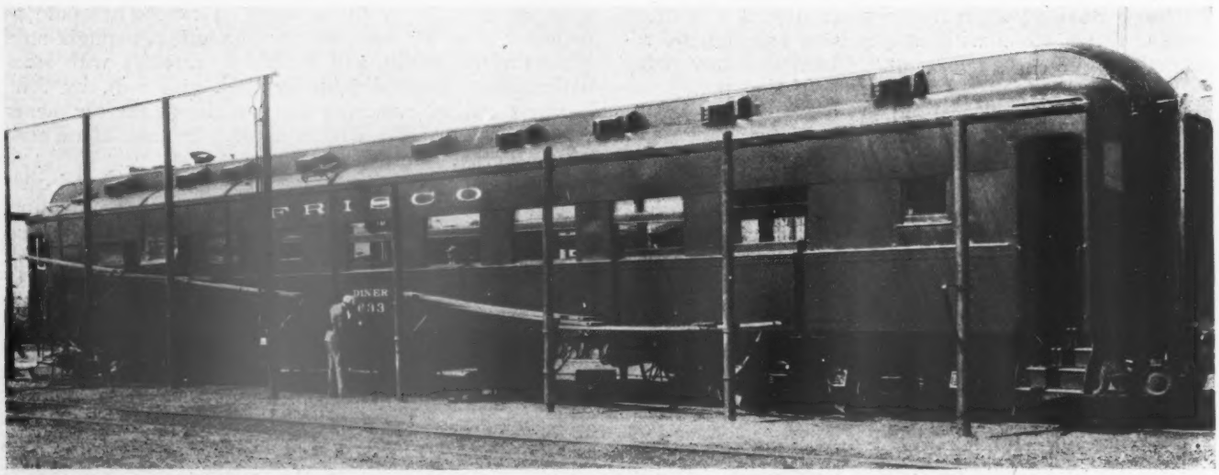
The whole dining-room is stippled. It is equipped with 30 aluminum chairs, grained in amber-colored Duco with leather seats and backs to match. The Frisco monogram is pressed in the seat backs in gold letters. The back passageway is lined with steel, grained in amber tones, and with three coats of Duco, hand finished.

Particular attention was paid to ventilation, Utility ventilators being used throughout the car; also three exhaust fans in the kitchen and one in the pantry. Attractive lighting fixtures, furnished by the Safety Car Heating and Lighting Company, are finished in silver; also all trim. Other specialties include Vapor heating system with thermostatic temperature control, Commonwealth 6-wheel, cast-steel trucks with integral pedestals and hook-type equalizers; also Simplex clasp brakes.



Air grinder used to save labor in smoothing off rough spots

The deterioration of the ordinary dining car, particularly about the kitchen, is rapid, electrolysis and corrosion sometimes cutting out the kitchen in a period of two years. In constructing the new diners, the Frisco, by the application of corrosion-resisting metal at neces-

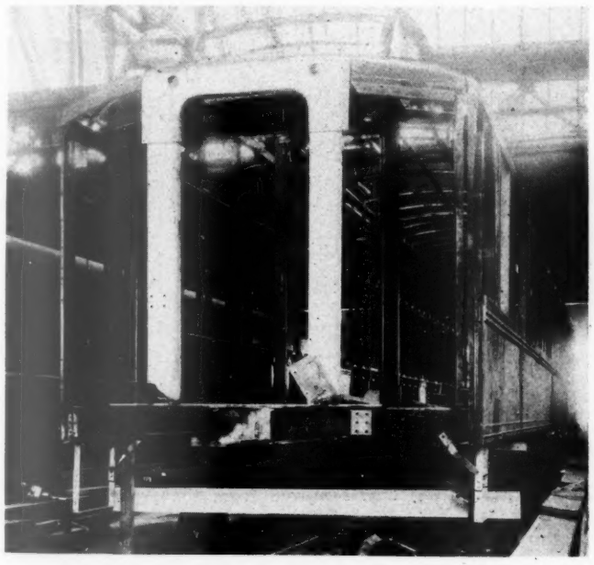


New diner receiving finishing touches at St. Louis-San Francisco shops, Springfield, Mo.

sary points, anticipates getting 20 years' service out of these cars with little maintenance.

Cafe-Lounge Cars

The same general plan of construction followed in the case of the dining cars was also adhered to in building the cafe-lounge cars. The kitchen and pantry were shortened to provide seating capacity for 18 in the dining-room and 19 in the lounge, including the lower section. The same light finish with wood veneer was used as in the dining cars. With one-inch hair-felt insulation, the new car is designed to be warmer in winter and cooler in summer than the original. The interior



Complete new framing applied, from the ceiling up

of the car is finished in fine Mexican mahogany with maple leaves stenciled in delicate colors on the wall. The lounge end of the car is furnished beautifully, and of more than passing interest is the fact that the upholstering of the chairs and the lounge was done in the upholstering shop at Springfield. The chairs are of different colored velour in pastel shades, and the carpet blends with the upholstering of the furniture. At one end of the lounge end is a large mirror, a book rack, and two berths behind the lounge and dining compartment which may be used for playing cards in daytime, and as lower berths at night for the crew on the car. The aluminum chairs, also used in the cafe-lounge cars, are upholstered in a gold-brown leather which harmonizes with the wall colors. The Frisco Line trade mark in red and white appears on the back of each chair.

The kitchen is the last word in dining-car equipment. Like the dining car kitchen, it is finished in Ascoloy stainless steel, which is easy to keep clean and sanitary.

Cars Finished in Duco

Since 1924, Duco has been the standard finish for steel passenger equipment on the Frisco, the shop at Springfield, Mo., being equipped with overhead ventilators and blowers for the safe application of this material. After a car is sandblasted, one coat of steel primer is applied, then three coats of surfacer and three coats of lacquer sprayed on, with about one hour between each coat. The car is permitted to dry for four or five hours and is then lettered.

The method of applying the letters is of special interest because it shows how the Frisco met a difficulty in this particular. By the old method, varnish size was applied, then the gold letters and a varnish coat over that, the result being, however, that the varnish surface was raised above the general level of the lacquer surface, and would not stand the cleaning. Lacquer now used on the Frisco does not lift the gold leaf, and the present method is by means of a masking tape. The letters and numerals are cut out and laid on the car while the latter is being lacquered. The stencil board is removed, the size applied and the gold laid. The gold leaf is protected with two coats of clear lacquer applied with a brush 30 minutes apart. With this method of application, the gold leaf lettering looks attractive and stands up well under cleaning, since its surface is flush with the general lacquer surface.

The time required for finishing cars with lacquer depends more or less upon the demand for the equipment. In emergency, the work on a sand blast car can be done in 7 days, as compared to 14 or more days with former finishing methods. The Frisco has cars in service since 1924, finished in Duco, and is unable to say what the service life, with fair usage, will be. A varnished car,

Beautifully-furnished lounge section of cafe-lounge car

Dining compartment of cafe-lounge car, looking toward the kitchen

on the other hand, is said to be good only for 18 to 24 months.

Method of Cleaning

After considerable experience with cleaners of different types, the Frisco is now using an oxalic acid base cleaner, being a composition of 3 lb. of acid to 50 gal. of water; 1 gal. of glycerine to 50 gal. of the mixture to prevent freezing and drying too rapidly in summer. Four gal, of molasses are added to prevent the acid from attacking the finish, and 3 lb. of cornstarch give body to the solution and hold up the acid. One pint of cornoto chemical is also added. This cleaner is put on with a scrubbing brush in the usual manner and rinsed off with water, giving the desired cleaning effect without appreciable damage to the finish.

A Japanning Oven That Is Heated by Gas

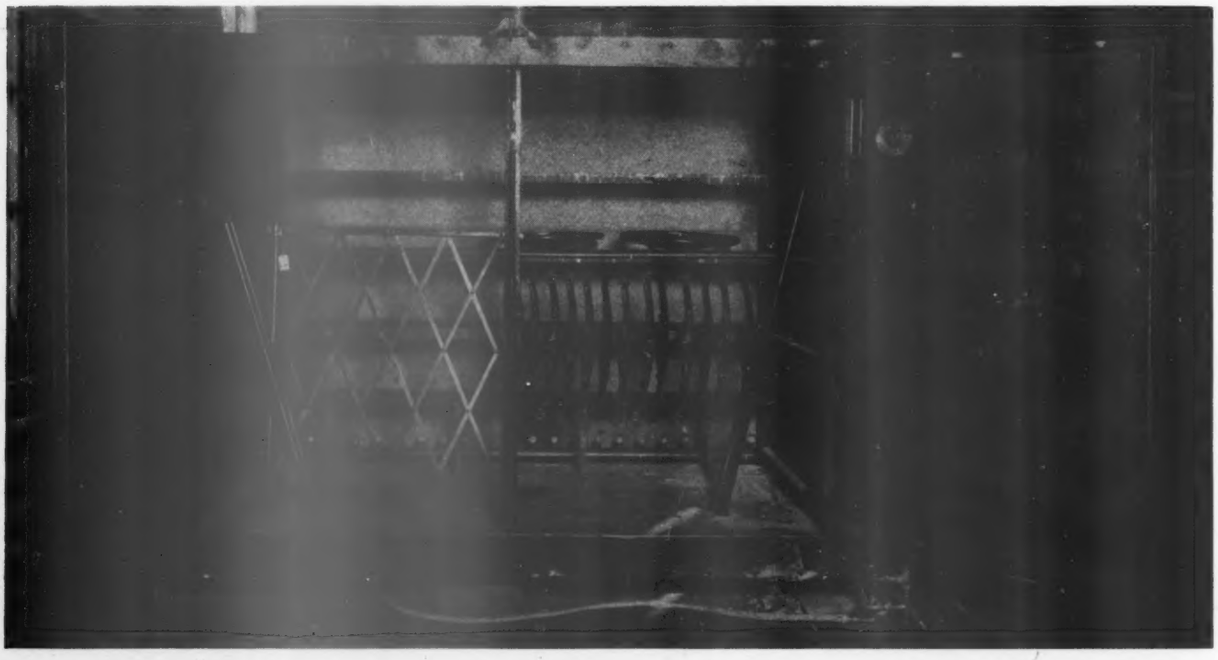
ONE of the illustrations shows a gas-fired japanning oven at the Chicago & Alton passenger-car shops, Bloomington, Ill., which is producing unusually good results and represents a marked improvement over the steam-heating method formerly employed.

The original oven was built at Bloomington shops in 1925, the interior dimensions being 7 ft. 1 in. long, 4 ft. 5 in. wide and 5 ft. 2 in. high. The oven is built of No. 16 gage sheet steel with 6 in. of 85 per cent magnesia insulation in the floor and walls and 4 in. of insulation in the top. The oven is provided with racks, or shelves, and equipped with two insulated swinging doors which may be closed and locked, making the oven practically airtight. The door shown at the right in the illustration is equipped with a peephole and a thermometer for accurately registering the temperatures inside the oven. The center T-iron, clearly shown in the illustration, is removable, in case of necessity, to insert large work in the oven. An 8-in. stack, applied since the installation of gas heat, permits the escape of the products of combustion. Damper control is provided in this stack.

When first constructed, this japanning oven was equipped with 2-in. steam coils at the bottom and back,

Steam-pipe heating unit removed from the japanning oven

welded into longitudinal headers and piped to the main boilers in the power house. This steam-pipe heating unit, since removed from the oven, is shown standing on end in one of the illustrations. With full boiler pressure direct from the power plant, the highest tem-



Gas-fired japanning oven used at the Bloomington (Ill.) passenger-car shops of the Chicago & Alton

perature obtainable in the oven with steam heat was 250 deg., or usually only 225 deg. F. Feeling that this method of heating the oven was wasteful in the use of steam and did not give the desired temperatures for the best results, the steam-pipe heating unit was removed and the oven rebuilt, as illustrated, to burn industrial gas by means of a Surface Combustion inspirator and a gas manifold employing 22 small composition lava tips, located near the bottom of the oven floor. The gas burns with a blue flame about 2 in. long. A sheet steel baffle, located over the lava tips, serves to protect any work which may be placed on the racks immediately above, and also prevents the dripping of any material on the lava tips.

With this method of heating, temperatures of from 400 to 600 deg. F. are available, when needed, being secured in 20 to 25 min. with 2½-lb. gas pressure, obtained from a centrally-located gas compressor. The oven is usually operated at a temperature of about 420 deg. F., depending on the character of the job. The bakes vary from 3½ to 4 hours, producing a much harder finish than is possible with lower temperatures.

Previous to the use of this baking oven, two helpers and two machine buffers and platers were required for cleaning, oxidizing and lacquering all passenger-car interior fixtures, locks, baskets, lamps, seat trim, etc. In addition, one man was required to take this material apart and re-assemble it, the output being 15 to 18 heavy repair cars handled a month.

The japanning oven, as equipped with gas heat, effects an important saving, not only over the old oxidizing and lacquering method, but over the steam-heat method. As compared with the former, only one mechanic and one helper are required, cleaning, dipping and baking being done without disassembling the parts. As compared with the latter, the finish lasts for three shoppings instead of two, on account of the superior finish secured with the gas-fired furnace. This means a saving in labor and material cost of 33 per cent on the basis of the increased life alone, and, with the gas-fired furnace which speeds up operations and gives two heats a day, the mechanic and helper are available a portion of the time for certain other work.

Distilled and Hot Water System

R. J. Needham

IN large coach cleaning yards, especially in the colder climates, hot water is desirable for most of the year for washing the outside as well as the inside of coaches. It is customary to have cold water effectively distributed in such yards, but it is also of advantage to have hot water available at many points to relieve the necessity of the car cleaners walking a considerable distance each time a pail of hot water is required. With hot water service located at only one point in a large yard for the inspection and cleaning of several hundred coaches, the average distance the cleaners would be obliged to walk, to obtain hot water, might be as great as six or eight hundred feet. With reasonable expense this distance can be reduced to at least one third, which would mean a great labor saving, and improve the efficiency and economical operation of the yard.

In such yards there is also a demand for distilled water for storage batteries. The distilled water required, however, is much less than the hot water necessary for cleaning. A thousand pounds of steam at the low pressure used will heat about 1,200 gal. (Imp.) of water from the ordinary city service temperature to about 118 or 120 deg. F. which is sufficient for cleaning purposes. If this quantity of steam when condensed during the process of heating the water is collected,

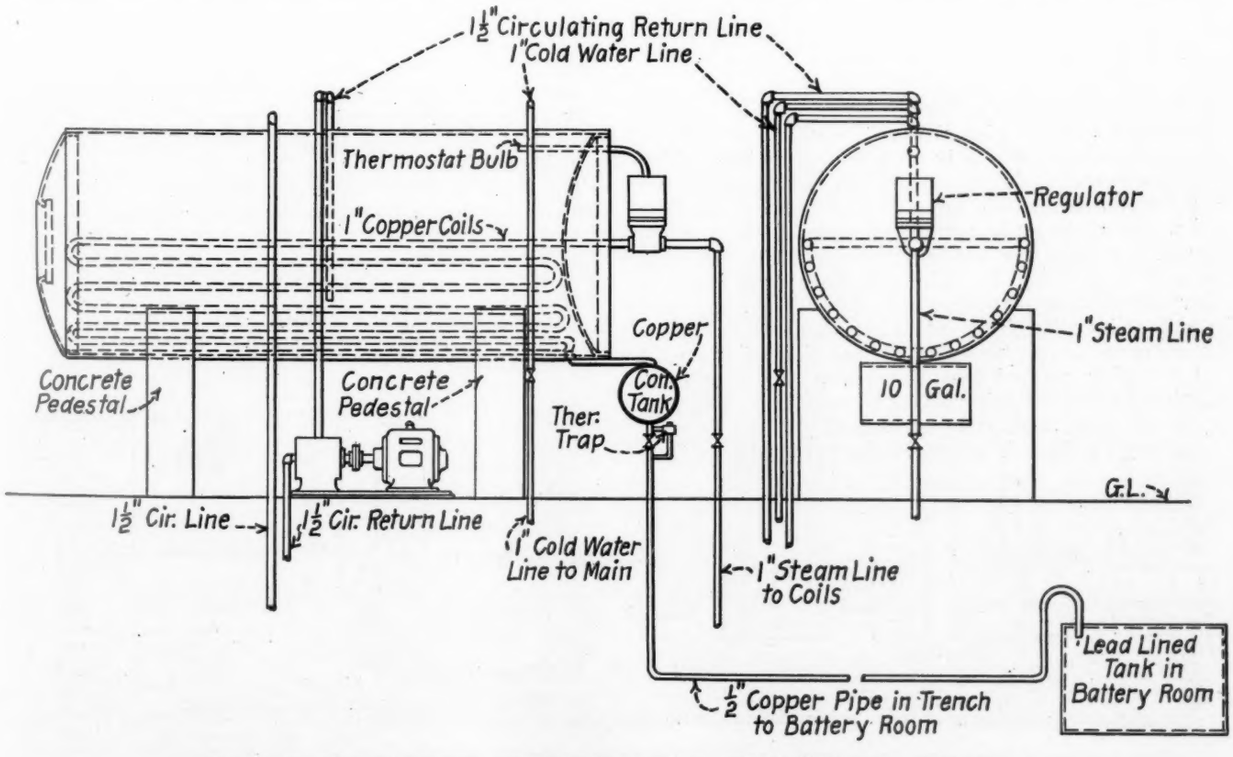


Fig. 1—Heating and storage tank showing the hot- and distilled-water connections

it represents 100 gal. (Imp.) of distilled water suitable for flushing storage batteries. Therefore, the production of the distilled and hot water, permits of a combination system similar to that which has been recently installed in the Canadian National coach yard at Toronto, Ont.

A 1,000-gal. steel tank shown in Fig. 1, which is insulated with about two inches of asbestos plaster, covered with heavy canvas and several coats of good weatherproof paint, is set on two concrete pedestals on the north side of the yard. This serves as a heating and storage tank, and is large enough that if a considerable quantity of hot water is drawn off suddenly, the water will not cool down appreciably. A 1-in. city water line is connected directly to the tank so that it is always kept filled and under city pressure.

A 1-in. copper heating coil in the tank is supplied with steam from the coach heating system in the yard through a reducing valve reducing the pressure to about 20 lb. A thermostatic regulator which is actuated by the temperature of the water in the tank, controls the steam to the copper coil. This thermostat can be adjusted to any required temperature. The lower end of the heating coil is connected to a ten-gallon copper receiver, Fig. 1, which is piped through a small thermostatic steam trap and a ½-in. copper pipe to a lead-lined storage tank in the battery-repair room. When the thermostatic regulator is open the steam pressure is sufficient to blow any condensate which may have collected in the 10-gal. tank into the distilled-water storage tank in the battery room.

A motor-driven centrifugal pump with a capacity of 20 gal. per min. is located in a small enclosure under the hot water tank which is used to circulate the hot water through the 1½-in. pipe loop located under the concrete platforms in the yard, Fig. 2. The power to drive the pump is small as it is only required to keep the water moving. The temperature is nearly uniform throughout the yard, the city pressure being at all times on the entire hot water system. Taps are taken off at every second platform through stop and waste cocks in the same pits that are provided for the cold-water hyrants, with handles for the waste cocks and the water outlets above the platforms.

The underground pipe lines are installed across the center of the yard, Fig. 3, in creosoted pump logs, which provides considerable heat insulation. The temperature of the water drops only three degrees between the flow and return at the tank, a length of about 1,100 ft. when 20 gal. per min. are flowing and when the water in the tank is 118 deg. F. The pipe lines were installed after the concrete platforms were laid. The pump logs were first installed from pit to pit about 18 in. below the surface. A pit was dug at one side of the yard and the pipe pushed into the pump log, length by length—the lengths being added by welding. The taps at the pit were welded in afterward.

As long as there is steam in the yard there is little danger of any of the lines freezing in extreme weather. After the job was completed it was found that there was a slight circulation even when the circulating pump was shut off and the centrifugal type of pump permitted the water to flow freely through it.

With a circulating system the water is kept warm up to the waste cocks so there is no waiting for hot water after the cock is turned on when drawing off a pailful. The use of the stop and waste cock in the pits permits the small amount of water in the goose-

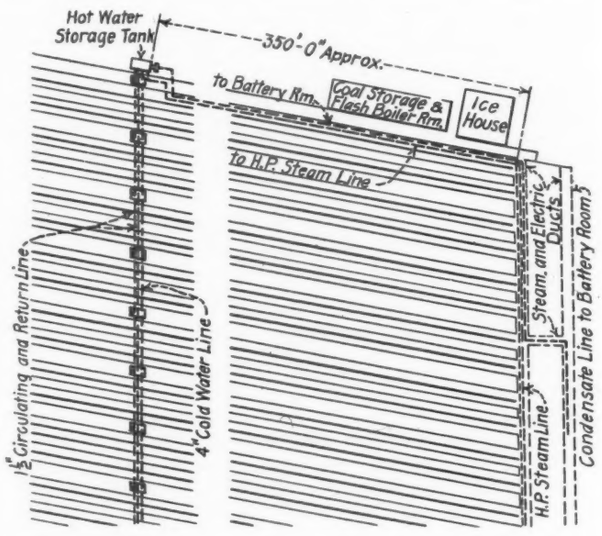
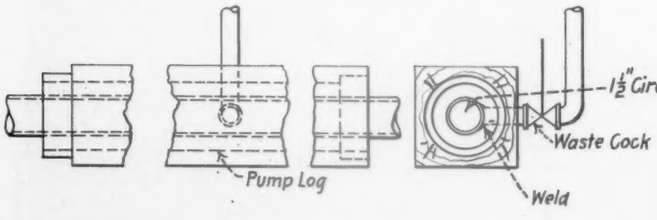


Fig. 2—Piping arrangement in the coach yard at Toronto

neck to drain off into the pit which is connected to the sewer so that freezing in this portion of the piping is prevented.

The economies of such a distribution system are easily apparent when compared with a hot-water supply from one location only, as formerly used. The average distance in the yard described is approximately 200 ft. It would be over 600 ft. if the source were at one point only, or a difference of 400 ft. per pail of hot water. Each car requires from 15 to 20 pails of water to wash it inside and out.

The distilled water may be considered as a by-product of the hot water system, but it represents con-



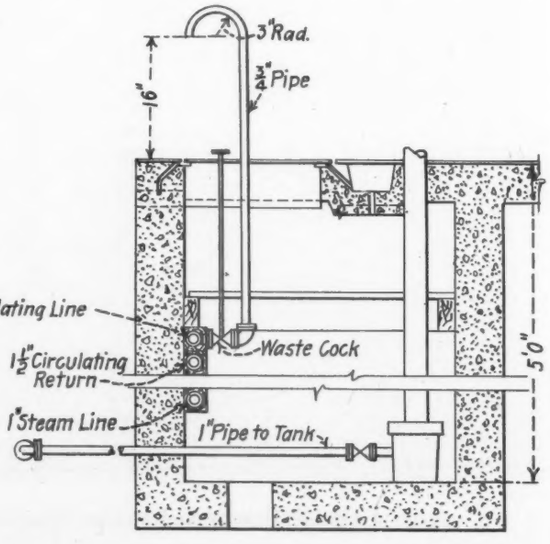


Fig. 3—Creosoted pump log and pit arrangement

siderable economy as the installation of such a system could be justified as a means of producing distilled water only. The quantities of distilled water produced are greater than required in the coach yard. The surplus, however, is turned over to the stores department which has considerable call for it from outlying points. The system is entirely automatic and when once set in operation continues through the 24-hr. period without requiring any hand adjustment.

Layout by Strips

IN repair work, particularly in railroad shops, the necessity often arises of duplicating or replacing a large sheet or shape for which there is no available drawing. Perhaps the most convenient method used is the layout by strips.

For example, take an ordinary gondola car which requires a new steel floor, the old sheets being corroded to such an extent that it is impossible to straighten them for use as patterns for the new sheets. The first step is to make a plan of the floor such as that shown in the drawing. The floor consists of six sheets and a center-sill cover plate. The four corner sheets *A*, are similar except that two are right-hand and two are left-hand. The same is true of the two longer center sheets *B*, one being a right-hand sheet and the other a left-hand sheet.

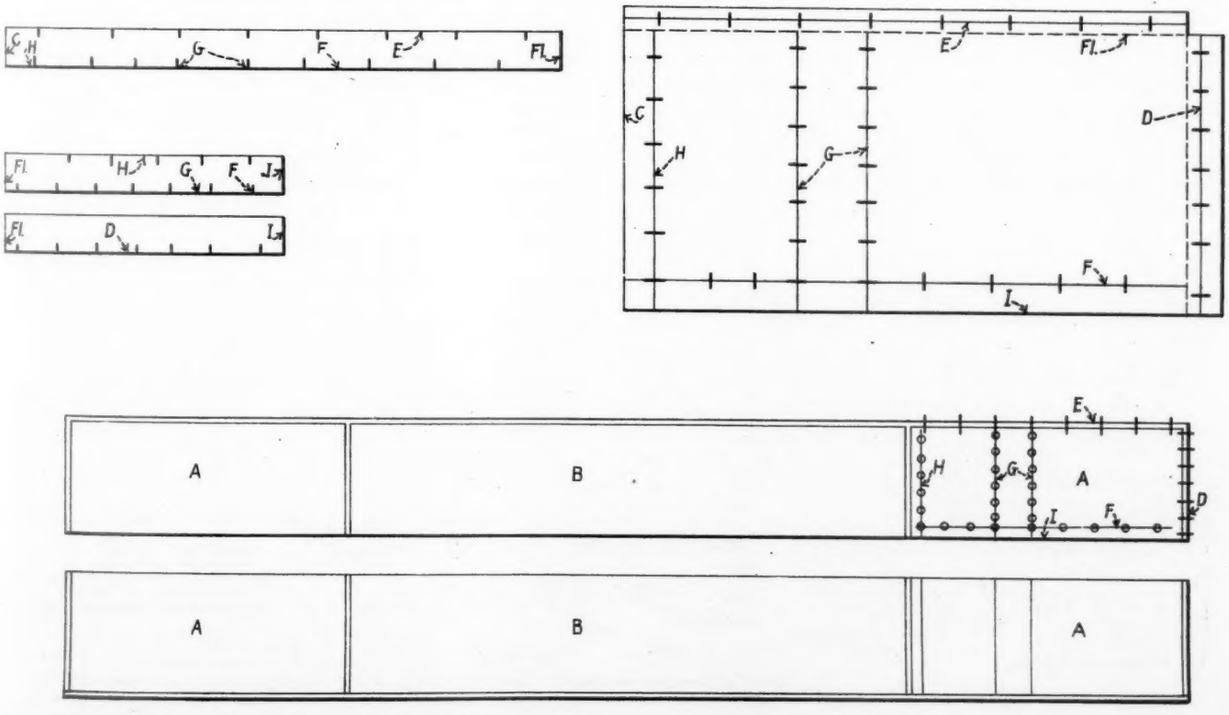
Since the four corners are symmetrical, a set of layout strips for one of them will serve for all, provided the two reverse sheets, the left-hand or right-hand as the case may be, are properly taken care of. The drawing shows the layout of one of the corner sheets and the strips required for the laying-out operation.

Light wooden strips with a smooth surface about one inch square are the most desirable for use in stripping the floor. The long strip covers the longitudinal lines on the corner-sheet *A* and the shorp strip covers the shorter transverse lines. The long strip is taken to the car after it has been swept and cleaned to expose all the rivet heads and is laid along the line *F* with the end marked *Fl* set against the end vertical flange of the sheet. In this position the various locations of all rivets along the line *F* are marked on the stick with a pencil. Where the transverse lines cross *F* they are marked with letters as at *G*, *G*, and *H*. At this point a note is made of the height of the flange *D*, also the height of the transverse line of rivet holes in it. The strip is moved over to the flange *E* and with *H* on *H* and *G* on *G* the holes in the line *E* are transcribed to the strip. This completes the two longitudinal lines.

Next, the shorter strip is marked in the same way. With the end marked *Fl* tight against the flange *E* and with the end marked *I* even with the inside edge of the sheet, transcribe the locations of the holes on lines *H*, *G*, *G*, and *D*. With the operations described, the strips necessary for the proper laying out of a new sheet have been prepared. The next step is the actual laying out of that sheet.

A blank sheet of steel large enough to make the completed work is required. Measured from the edge *I* of the new floor sheet, draw the line *F* parallel with the long edge of the sheet and at the proper distance from the edge as marked on the short strip. A chalked thread is preferred to a straight edge for marking lines on large sheets. Lay the long strip along the line *F* just drawn, keeping the end *C* even with the left end of the sheet. It is important to keep the strips always in their proper relative positions. From the strip mark off all the holes and intersections, transcribed from the original floor sheet, on the line *F*.

It is of the highest importance to keep the work square. To do this, erect a perpendicular on the line *F* at some convenient intersection, the second line *G* in this case being the most convenient. The perpendicular



Above: A new floor sheet and the strips used in laying it out—Below: The gondola floor with sheet A lettered for marking the layout strips

at *G* will serve as a guide for all future lines and gives a permanent point from which all measurements are taken.

Using the short strip as a measuring rod, draw line *E* parallel with *F*. Lay the long strip on this line and mark off the intersections *H*, *G*, *G*, and the end flange line *Fl*. The left margin *C* also is marked while the long strip is in position. While marking these intersections care must be taken to see that the proper *G* coincides with the perpendicular *G* which was erected to keep the work square. Connect the intersections marked on the side-flange line with those marked on the line *F*. Using the short strip, mark all the holes on lines *H*, *G* and *G*. This completes the web of the sheet. It is good practice to tram diagonally from corner to corner to determine if the square has been maintained. The adding of flanges and flange-line holes are simple operations involving the same principles as explained for the web of the sheet.

The first corner sheet may be sheared and punched and used as a patter for laying out the remaining three corner sheets, or if the sheets are large, heavy, and difficult to handle, the same method may be used for all, i. e. the strip method. For the reverse sheets, start operations from the right-hand side instead of from the left-hand side as given in the example. The same methods are used for sheets *B* as for sheets *A*.

Primarily, the layout by strips is intended for work for which accurate drawings are not available. Often, however, it is found convenient to make the strips from drawings as the strips are so much lighter and easier to handle and store than heavy, cumbersome patterns or templates.

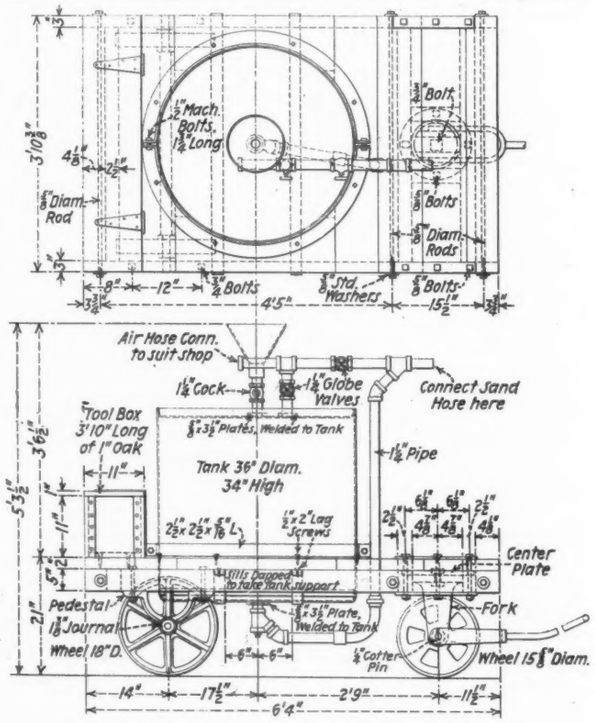
A Modern Sand-Blast House—A Correction

On page 578 of the October issue of *Railway Mechanical Engineer*, there were two illustrations showing a modern sand-blast house. The captions under these pictures indicated that this installation is located at the Russell, Ky., shops of the Chesapeake & Ohio whereas the equipment is actually located at the new Huntington, W. Va., locomotive shops of the same road.

A Portable Sand Blast

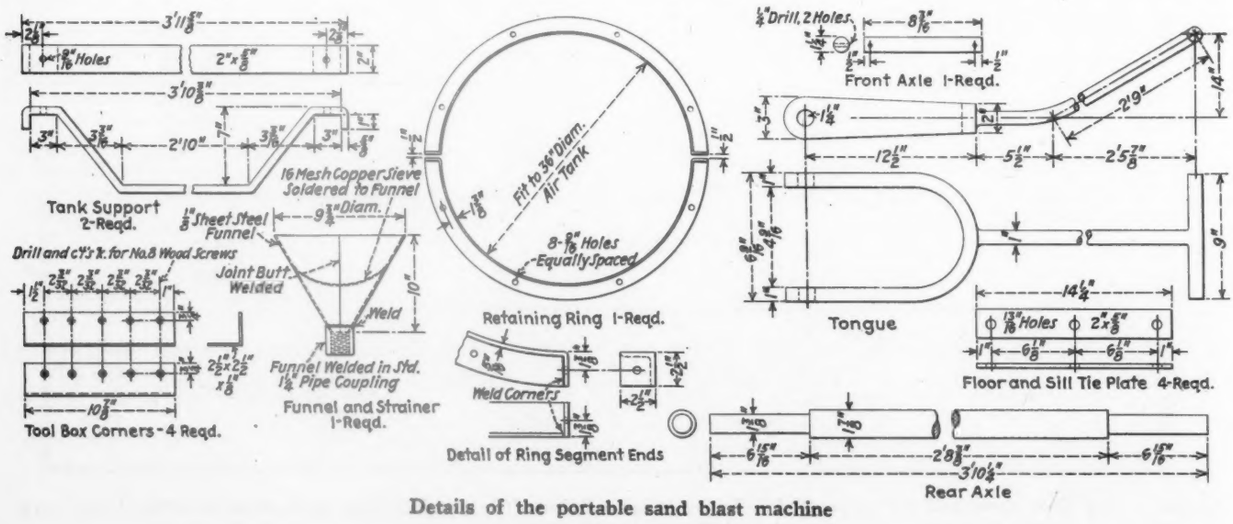
A PORTABLE sand blast is a convenient facility around any car shop. The equipment shown in the two drawings consists essentially of a scrap locomotive air reservoir, a three-wheel truck and suitable air-line connections. The tool box, which is placed on the rear of the truck, is not an essential part of the equipment but is a convenient accessory for the workmen.

The dimensions of the detail parts shown are for a sand blast having a 36-in. air reservoir. Sand is poured



Elevation and plan of the portable sand blast

into the tank through a funnel, which is provided with a 16-mesh copper sieve. The tank is filled to within a few inches of the top and the 1¼-in cock in the filling pipe is closed. Connections for the air hose from the shop line, and for the sand hose are indicated on the



Details of the portable sand blast machine

drawing. The effectiveness of the sand blast can be easily made to suit by adjusting the flow of air through the two 1¼-in. globe valves in the air lines.

Decisions of Arbitration Cases

(The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Car Damaged in Unloading

Atlanta, Birmingham and Coast car 9076, loaded with telegraph poles for Marion, Ala., was delivered to the Southern by the A. B. & C. at Birmingham, Ala., February 12, 1929, in good mechanical condition. It was received empty from the Southern by the A. B. & C. with the following defects: one side sill broken, three U-bolts broken, one stake pocket missing and three U-bolts missing. The A. B. & C. requested a defect card to cover the damage, which was declined by the Southern. Investigation developed that the damage occurred when Postal Telegraph employes cut the wires with which the telegraph poles were fastened to the car, allowing the poles to spread.

The Southern stated that the settling of the load against the side stakes is not an unusual occurrence in unloading poles and would not have resulted in any damage to the car had the sill been sufficiently strong to have withstood this strain. It was the contention of the Southern that no condition of Rule 32 was involved that would relieve the owners of responsibility for the failure of their car under the circumstances.

The owner contended that the nature of the damage was similar to damage caused by clam shells and, in accordance with Rule 32 and interpretations thereof, a defect card should have been issued to the receiving line and the handling line should collect the amount of the damage from the company the employees of which damaged the car.

The following is the decision as rendered by the Arbitration Committee: "There is no evidence of unfair usage within the intent of Rule 32. Car owner is responsible." *Case No. 1642—Southern vs. Atlanta, Birmingham and Coast.*

Car Repaired Without Owner's Authority

On February 10, 1928, the Terminal Railroad Association of St. Louis reported to the Missouri-Illinois that Missouri-Illinois car 3034 was being held on its line for disposition subject to the provision of Rule 120. The car was inspected by a representative of the Missouri-Illinois who found it in a badly damaged condition. On February 17, 1928, the Missouri-Illinois authorized the destruction of the car but declined to assume responsibility for its damage. The Terminal Railroad Association had the understanding that the depreciated value of the car was considerably more than the cost of repairs and that it had the right to dispose of the car in the manner that would be the least expensive to it in case it had to assume the responsibility for the damage. After a lapse of 30 days, it repaired the car and rendered its bill for $256.60. This bill has been declined by the Missouri-Illinois.

A sub-committee of the Superintendents' Association Interchange Committee, consisting of representatives of the T. R. R. A. of St. L. Frisco, Missouri-Kansas-Texas, and Cleveland, Cincinnati, Chicago & St. Louis and Illinois Central, together with the chief interchange inspector, inspected the car on January 19 and reported that in its opinion the defects represented the car owner's responsibility and the car should be reported under Rule 120. The repairing line contended that the car owner in declining to assume responsibility for the car forfeited any right to determine whether the car should be repaired or destroyed, thus, in view of the refusal of the car owner to assume responsibility, the St. Louis Terminal repaired the damage since in its opinion that was the most economical way in which to dispose of the car.

The owners contended that the car was not handled in accordance with Rule 1 when the car, loaded with frozen concentrates, was received by the repairing line. The owners further contended that the contents of the car should have been transferred and the car repaired or sent back to the Missouri Pacific for repairs or to be returned to the owners as a bad order car. The owners stated that the statement submitted by the sub-committee did not in its opinion comply with interpretation under Rule 44 and, since it did not show the cause of the damage to the car, it proved that the car was not given the necessary attention required by Rule 1.

The repairing line stated that it made a careful investigation of the handling of the car and that it found that the car was not in any accident involving Rule 32. It further contended that the report of the investigation, together with the report of the sub-committee, fully complied with the requirements of paragraph 1 of Rule 44.

In rendering a decision the Arbitration Committee stated "The defective condition of this car is owners' responsibility on basis of Rules 32 and 44. The car was a proper subject for disposition under Rule 120, for decision of owner as to whether it should be repaired or dismantled.

In view of owners' decision that the car should be dismantled, pending decision on the question of responsibility, handling line was not justified in repairing the car. In any such case of disagreement as to responsibility for condition of the car, the last sentence of Interpretation 3 to Rule 120 does not apply, unless the owner fails to furnish disposition as per first sentence of same interpretation.

In order to settle this case, with due consideration to the fact that it would not have been necessary for the handling line to report the car for decision of the owner as to disposition if the total labor charge had not exceeded the limit allowed on the car under Rule 120, it is the opinion of your committee "that the Terminal Railroad Association of St. Louis should reduce the total labor charge to the limit allowed on the car and the same percentage reduction in the total charge for material, on basis of Interpretation 2 to Rule 120. Decisions 1053 and 1189 indirectly apply." *Case No. 1641—Missouri-Illinois vs. Terminal Railroad Association of St. Louis.*

In the

Back Shop and Enginehouse

Spring Making and Repairing *

By W. J. Wiggin

Blacksmith Foreman, B. & M., North Billerica, Mass.

LAST year at our convention, I made several broad statements about what we were going to do at Billerica, Mass., and I also told you about the elaborate equipment that had been installed to manufacture springs. This equipment has proved satisfactory in every way. The statements that were made have been carried out to the letter and we are getting good results in our spring department.

In the manufacture and repair of leaf springs, it is well to reflect on the fact that this involves a thorough understanding of the four fundamental requirements of heat treating to obtain proper physical characteristics, and combining with the above, the practical shop details entering into the performance of the work.

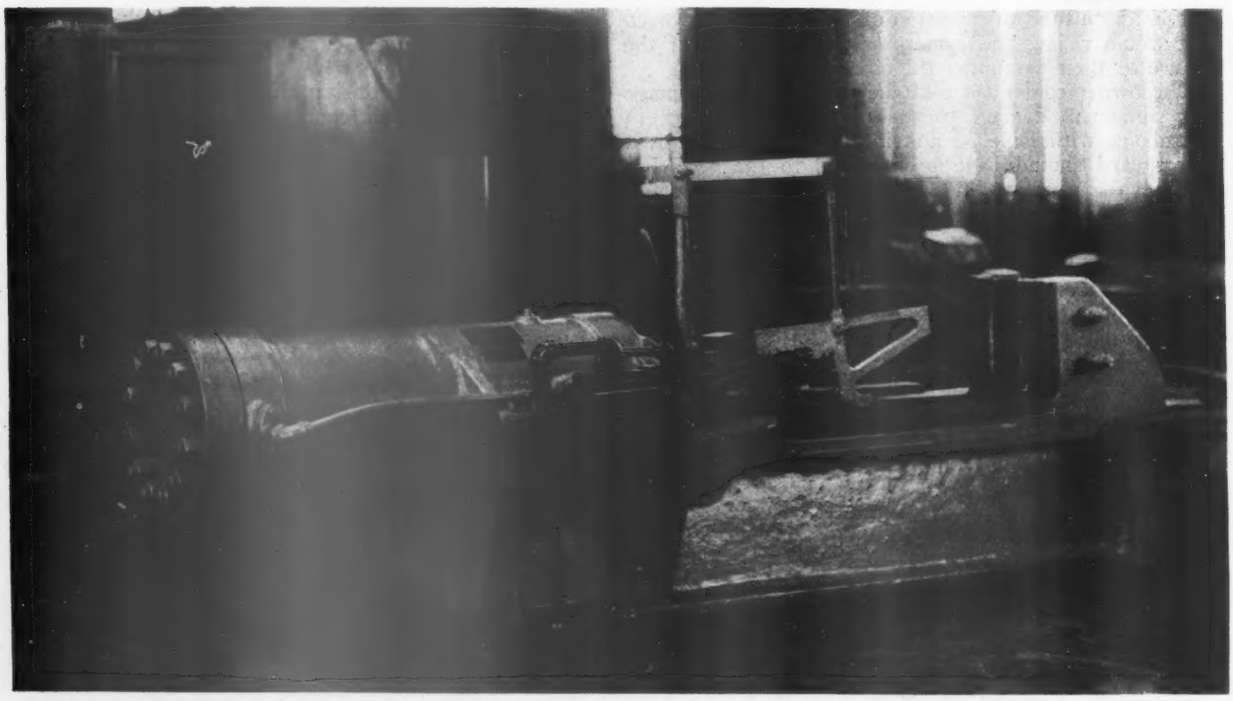
The four fundamentals involved in obtaining the correct physical characteristics of the steel are that the steel must be of uniform quality, that is, of the proper physical and chemical characteristics within the closest practical manufacturing limits; proper heating at a speed not greater than that which the steel will absorb and a thorough control of the heating in all the steps of manufacture, at the proper degree and sufficiently high above the critical temperature (not exceeding 1,500 deg. F.) in order that the drop between the furnace and quenching bath will not be sufficient to have the heat at quenching lower than the upper critical temperature; the use of a quenching medium of such a nature that it will have a high rate of heat convection or transfer to insure the setting of the steel at the proper grain structure (this rate must be uniform regardless of its working temperature or its age); and the temperature of the furnace used in drawing back must be uniform throughout, that is, the leaves in their entire length must be subjected to the same temperature for the same length of time.

Brinell hardness is not an infallible guide in determining the physical characteristics of heat-treated steel. The essential feature in the spring's standing up is to obtain the highest possible tensile strength with an elongation high enough to insure maximum deflection without breaking.

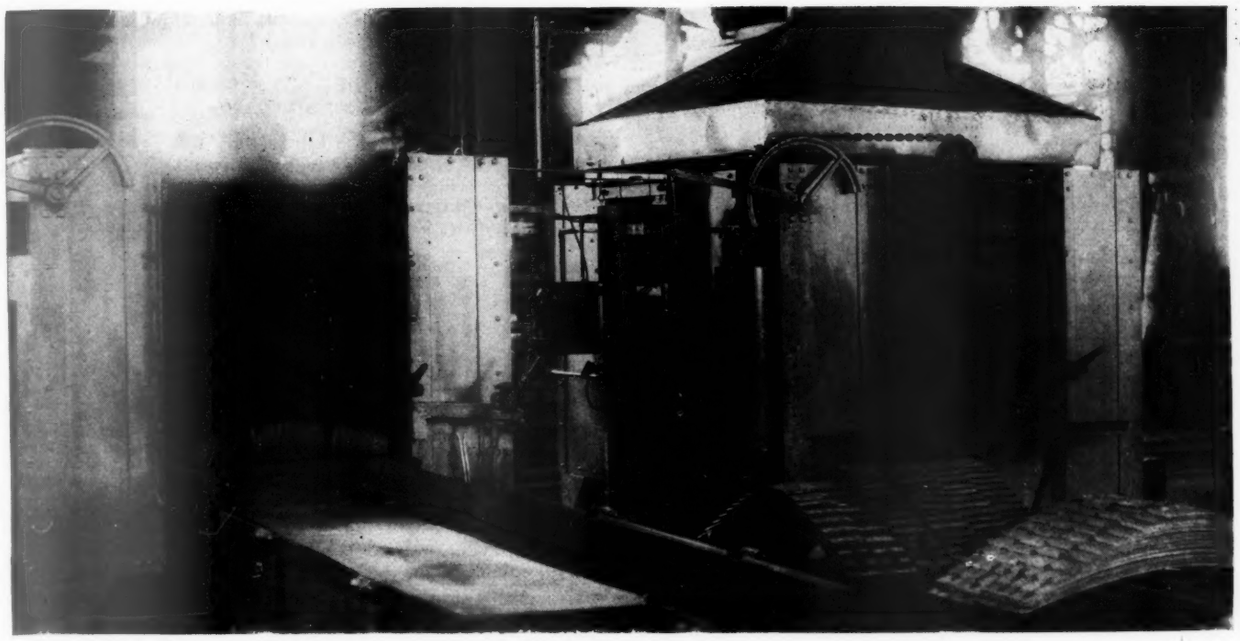
In supporting the above principles, we will proceed on the basis of using carbon steel and begin with the operation from the time the broken spring reaches the spring plant. In general the specifications for carbon steel springs call for variations in carbon content from .90 to 1.10. It is possible to decrease this variation somewhat without increasing the cost of manufacturing the steel, as the carbon content from 0.90 to 1.05 is available to be used, which will give a more uniform product and reliable service.

In stripping springs for repairs, it has been found

* Abstract of paper presented at the thirty-fourth annual convention of the International Railroad Master Blacksmiths' Association, Chicago, September 23 to 25, 1930, inclusive.



Spring stripping machine showing a specially designed header for stripping all sizes of springs



Quenching furnace and tank on the left—Drawing furnace on the right

that many spring failures result from minor surface defects, hammer dents, scored surfaces, abraded and cracked nibs, etc. Special care should be taken to make a close inspection of the surface of the leaves and throw out such as contain any defects, no matter how slight.

We have established a limit of thickness on all our spring plates. This limit is checked by a set of gages. Any plate found over which this gage will slip down on any part, is thrown out. When we first started using these gages, we scrapped a considerable amount of spring steel, but we expected this.

In stripping springs, we try to keep all the new steel out of the repaired springs. I mean by this that we cut back old plates that are up to size in order to make a complete spring. By doing this, it sometimes takes 15 or 20 springs to make 10 or 12 good ones. But when this spring is put under the tester, we know that there is no new steel to take up any defect that the tester might show up on a repaired spring. It is necessary sometimes to put in a new main plate on account of the plate being cracked through the slot. Formerly, these slots had a boss before we adopted the spring shoe.

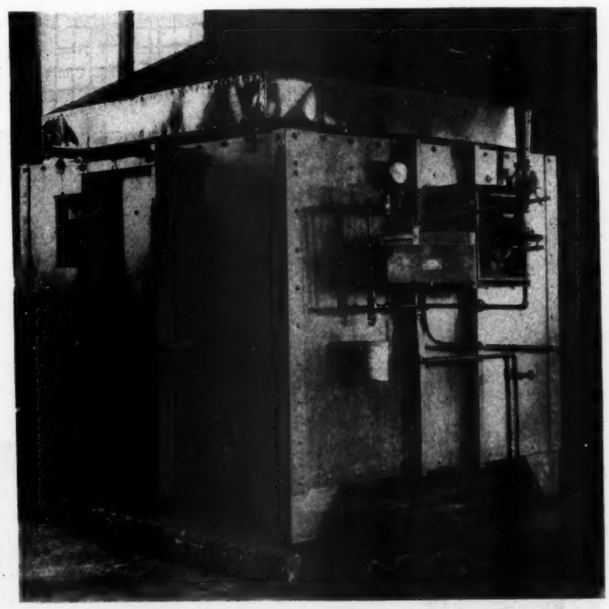
Limits Governing the Rejection of Thin Leaves in Repairing Springs for Locomotives

Plates, in.	Minimum thickness, in.
¼	0.240
⅜	0.360
7/16	0.420
½	0.480

All springs are stripped and checked for any defect, including the size of the steel, and assembled for fitting by one blacksmith and a helper who also do the fitting for the spring shop.

When springs are assembled for fitting, they are placed in a furnace and heated to 1,600 deg. F. for 45 min. They are then formed and placed on a cast-iron table to cool to at least 450 deg. before being reheated for quenching. After forming, the leaves are heated to 1,500 deg. F. for 60 min., and then immersed immediately in quenching oil and left in this oil until they will not flash the oil when removed,—about 300 deg. F. After the leaves have cooled sufficiently, the pan in the quenching bath is raised by air cylinders and the oil allowed to drain off the leaves. They are then transferred to a drawing furnace. This furnace is a plain open-fired furnace vented under the floor, the floor consisting of a ⅝ in. plate with 2½-in. holes about every 6 in. This plate is 9 in. from the bottom of the furnace. The temperature of this drawing furnace is 800 deg., and the plates are held in it for 20 min.

After the springs have been drawn, they are allowed to cool and the band is applied and stamped with the class of spring and date. While the band is hot, they



Back of the drawing furnace showing the Brown control—Also a six-pole Brown indicating instrument used at times to check the temperature in the drawing furnace against the automatic control—This provides eight points by which the temperature can be checked

Fitting furnace showing the table over which hot plates are slid to the fitting machine—Automatic-control apparatus for the furnace is shown on the wall at the left

are submerged in a tank of lubricating oil and allowed to soak in this oil until the next spring is banded and is ready to be put in the lubricating oil.

After coming out of the lubricating oil, the spring is placed under the testing machine and tested by a man from the office. He is the absolute authority on the testing of these springs and if there are any springs that do not stand up to requirements, they are stamped as defective springs and the reason put down on the test sheet. These springs are set aside for decision on what shall be done with them.

The preceding paragraphs give a description of the proper method for heat treating springs which is found to be essential. Carelessness or lack of attention to any of the details will destroy the efficiency of the equipment as its success depends on close attention to detail. However, there is nothing difficult involved in carrying out the process, and while there may be a slight modification in equipment, the system as a whole can be relied on for giving dependable results.

Procedure on Springs Manufactured for Test Purposes

Fourteen springs of ½-in. by 5 in. spring steel with 15 leaves were formed in accordance with the heat treatment described, and each spring accompanied by a test piece. These springs were heated in a quenching furnace in pairs with their corresponding test pieces, to 1,500 deg. F., then quenched in a circulating bath of quenching oil. Brinell readings were taken on each of the hardened test specimens. After quenching, the springs were drawn in a draw furnace, as described, with one test specimen representing each heat.

Springs Manufactured and Tested at Billerica From January 2, 1930, to August 1, 1930, Inclusive

Month	Driving	Trailing	Eng. Truck	Tender	Defective Springs
January	440	34	94	0	36
February	339	27	12	55	12
March	275	40	42	48	21
April	347	50	90	151	29
May	447	42	45	173	77
June	180	0	54	58	0
July	164	0	33	175	13
	2192	193	370	660	188
			Total		3,415

Note: The actual performance would be the total less the number of defective springs for this period. Actual performance: 3,415 less 188 = 3,227. This is based on shop-order production only. The percentage of defective springs would be 5.5 or an efficiency of 94.5 per cent.

The springs were then banded and stamped, dipped in lubricating oil and depressed once under the tester to take up any space between the leaves.

The 14 test springs were first checked to specifications, after which the height of each was determined under a 50,000-lb. static load. Each spring was then compressed in a bulldozer 1,000 times with the stroke adjusted to produce a height equivalent to that obtained under the 50,000-lb. static load. This load was applied at the rate of 390 loadings an hour by the bulldozer. At the completion of 1,000 loadings on the bulldozer the springs were taken again and checked under the static machine and a new height under the 50,000-lb. load determined. All the springs were again returned to the bulldozer and 1,000 load applications were made

Lubricating bath and rack for oiling the springs after banding

at this new height. The fracture of any plate except the shop plate was recorded as a failure of the spring. The application and location of each break was noted. The tests were continued in this manner checking the heights of each spring on the static machine after each 1,000 applications on the bulldozer, until 10,000 applications had been reached. Then the tests were discontinued. The same jigs, pins and hangers were used throughout the test and all errors due to wear were checked on each spring.

The following points were maintained constant in the manufacturing of these test springs: Forming temperature 1,600 deg. F., time in furnace 45 min., allowed to cool to 450 deg., in quenching furnace 60 min., in drawing furnace 20 min. Brinell readings were taken at three points on each test specimen.

The forming furnace is over-fired, under-vented, 54 in. wide and 72 in. long, with a door opening 12 in. by 24 in. The quenching furnace is over-fired, under-vented, 54 in. wide and 72 in. long, with a door opening 12 in. by 24 in. The drawing furnace is over-fired, under-vented, 54 in. wide and 72 in. long, with a door opening 12 in. by 24 in. This furnace has a floor made of ⅝-in. boiler plate in three sections with 2½-in. holes 6 in. apart all over the floor. This boiler-plate floor is 9 in. from the bottom of the furnace. The heat in the furnace has to heat the spring plates first, and then goes through holes in the plate floor and out through a vent hole in the wall at the bottom of the furnace.

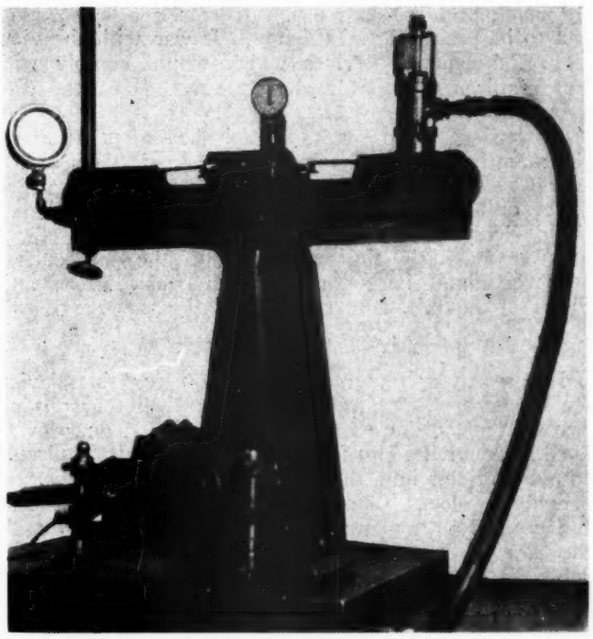
Each furnace is equipped with automatic control, also with a recording instrument in the office which records the temperature in three furnaces on the spring job. An indicator instrument is located at each furnace by which the man on the job knows what the temperature is. Each furnace is equipped with an electric clock and horn. These clocks have a red hand and a black hand. The red hand is set to the number of minutes the steel is to be in the furnace. The black hand starts to run to zero on the clock. When it reaches zero it blows a horn until the men open the door of the furnace and pull the heat. These clocks cannot be set back once the furnace door is closed and the furnace door cannot be opened while the clock is running until it has reached zero and the horn blows.

The spring shop is equipped with the following: One nibbing machine, one 60-ton stripping machine, one 170-ton banding machine, one testing machine, one punch and shears, one 12-oz. blower, one chain forming machine, one 800-gal. capacity quenching tank, one quenching-oil circulating system, one banding furnace, 36 in. by 36 in. by 14 in.; and one 300-gal. lubricating bath and rack. The spring-shop force consists of two blacksmiths, two helpers and one laborer.

*Testing Devices for Pneumatic Tools and Jacks**

THE use of testing devices for pneumatic tools and jacks is one which we consider of great importance and deserves the serious consideration of this association in order that suitable devices may be recommended which will be simple in design and construction, efficient in their operation and can be manufactured at a cost that will not involve a great expense.

* Report of a committee presented at the convention of the American Railway Tool Foremen's Association, held at the Hotel Sherman, Chicago, September 10 to 12, inclusive.

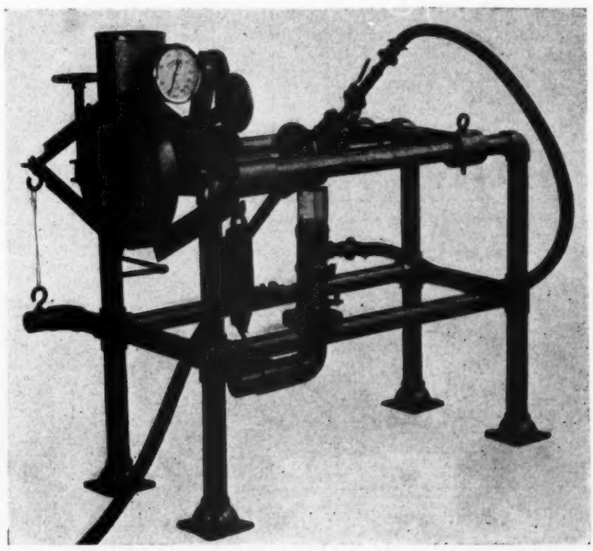


Test rack used on the Pere Marquette for checking air-motor performance

No tools that have been brought out in recent years have done more to reduce the manual labor of the mechanical worker and at the same time increase his output than jacks and pneumatic tools. At the same time no tools in the shop receive worse treatment and abuse, with the result that the tool room is called upon to put them in serviceable condition again.

It is at this time that the use of testing devices is essential in order to determine their deficiency and efficiency prior to and after their repair. They are also required for making tests periodically after the tools have been placed back in service to determine whether they are capable of further service without further repairs.

There are a number of devices which have been developed for this purpose the excessive cost of some



Convenient and effective pipe stand, Prony brake and equipment used in testing air motors

of which prohibit their use. Others have been found not to be practical and efficient. It was with the view of recommending devices which would comply with our requirements that a study was made of the different devices in use.

Towards this end we solicited the co-operation of the manufacturers of jacks and pneumatic tools in addition to our membership with the result that we collected quite a number of drawings and photographs of the devices in use.

After making a thorough study of the data collected we submit herewith for your consideration and approval the following recommendations:

Air-Motor Test Rack

In presenting our recommendation for this device we submit herewith the drawings and photographs of two test racks, one of which was designed and developed by A. Meitz, tool foreman, Pere Marquette, Grand Rapids, Mich., and the other by a manufacturer of pneumatic tools. There are no patents on the test rack made by the manufacturer of pneumatic tools with the exception of the tachometer and flowmeter. Therefore, you are at liberty to construct this rack should you desire to.

The air motor test rack in service at the Wyoming shops of the Pere Marquette consists of a base plate with four T-slots in which two adjustable posts, equipped with clamps, can be set to accommodate any size motor. The spindle extends through two bearings one at the front and one at the back of the machine. Directly in front of the column is a brake wheel with a strong brake band and clamping device so that the brake can be tightened to give the motor the required pull. The pull is regulated by means of a ratchet on the adjustable screw.

The column on this device is of sufficient height to accommodate an 18-in. torque arm between the center of the brake wheel and the pull of the cable, the latter being attached to a spring scale of 300 lb. capacity. A single rope pulley is mounted on the back of the motor shaft while two such are situated on top of the arm which connects the tachometer spindle for gaging the revolutions per minute.

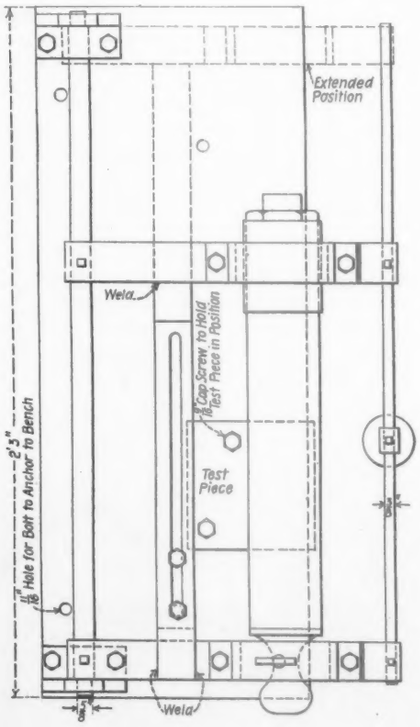
An air gage, mounted on the left side of the cross arm, shows the air pressure, which should be not less than 80 lb. per sq. in. On the right a toolometer registers the consumption of air in cubic feet.

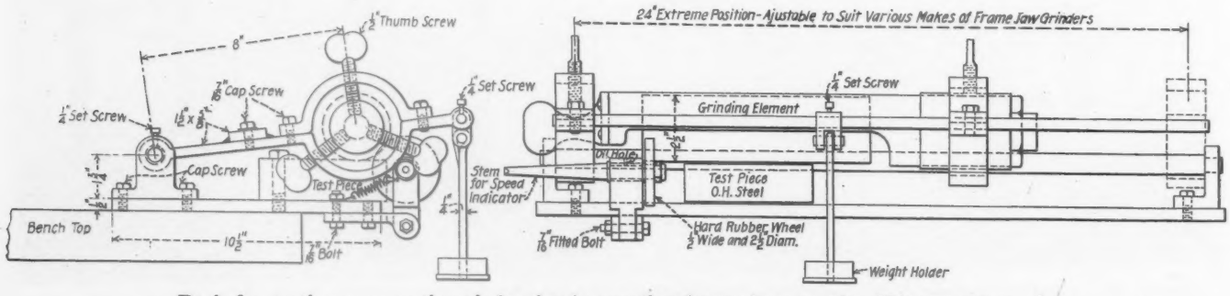
All new motors are first tested prior to being issued for service and a record kept of their performance. During the first year of service this test is repeated following each three months of service. Repaired or reconditioned motors are likewise tested both before and after repair. Motors falling below one-third of their initial test are removed from service and replaced with new. It is false economy to curtail the purchase of needed motors, far in excess of their price being lost through delay and inefficiency on the job.

This test rack has proved practical in every way and saved untold troubles and delays in the operation and maintenance of pneumatic motors. It has unqualified endorsement and has been enthusiastically received by mechanical department officers from many roads visiting the shops.

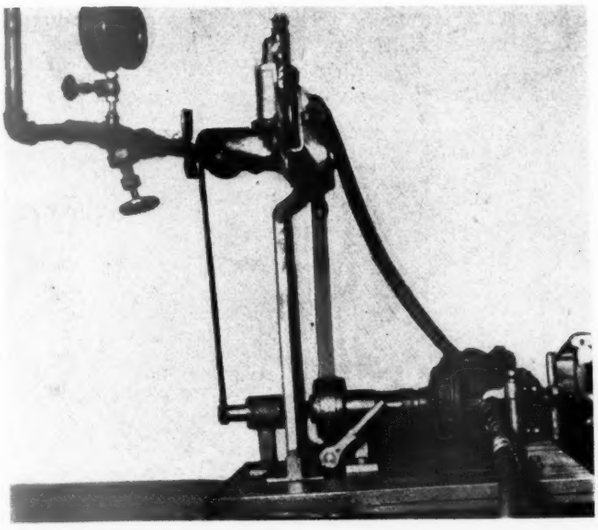
The other test rack consists of a stand made of 2-in pipe and fittings with one stationary horizontal arm and one adjustable horizontal arm which can be adjusted to accommodate any size motor. The rack has provisions for ratings both forward and reverse by interchanging the stop wire and the graduated spring scale at either end of the double channel-iron torque arm. A tachometer is geared to the Prony brake mechanism which consists of a cast-iron wheel, with brake band and maple-block brake shoes capable of being tightened against the brake wheel or loosened by means of the hand screw illustrated. Water, piped to the brake wheel, is used to keep the maple blocks from over heating.

The air consumption is found by the use of a flowmeter, and readings of the spring scale and motor speed make it readily possible to figure the horsepower developed.





Rack for testing pneumatic grinder for locomotive frame jaws at the Chicago shops of the Chicago & North Western



Side view of air-motor test rack showing additional details of construction

During the past few years the use of pneumatic frame-jaw grinders has increased with the result that a device had to be designed to test these grinders.

The Chicago & North Western has developed a rack designed for ascertaining the merits of different makes of grinders and it is our opinion that, in view of its simplicity in design and construction and the fact that it would not involve a great expense for its manufacture, you will find it satisfactory.

The grinder is centrally located and held with thumb screws into the arms of the rack. These arms are hinged to a bed plate 10½ in. by 27 in. A toolometer is connected into the air line to the grinder to determine the air consumption. To determine the r. p. m. of the grinder, a friction wheel with expanding spindle is used in connection with a speed indicator. The diameter of the hard rubber friction wheel is equal to the diameter of the grinding wheel. The test material is accurately weighed before and after each test to determine the amount of stock removed in a given length of time. For applying pressure during the grinding operation, weights are applied to the weight holder. In making this test it is necessary to use the same kind of grinding wheel as to grain, grade, etc., for each individual grinder.

Test Racks for Air Hammers

Quite a number of different devices are in use for the purpose of testing air hammers, however, we believe that the test rack, which was designed and developed recently by W. E. Buck, tool foreman, Jackson shops, Michigan Central, offers a device, which, with the use of a chart, takes all the guess work out of how hard a hammer is hitting and gives you the facts in regard to what your old hammers are doing and enables you to maintain a record of such tests.

In order to explain the operation of this device as clearly as possible the various parts have been designated on the photograph with symbols which will be described herewith.

Part *A* acts as a guard and support for the hammer to be tested. It has a block welded inside and cupped out so that the barrel of the hammer rests in this block. This is done so that all of the pressure exerted on the hammer by the person testing will be applied to the base of the machine. No matter how hard he bears down on the hammer it will not effect the readings. Only the blow will be recorded.

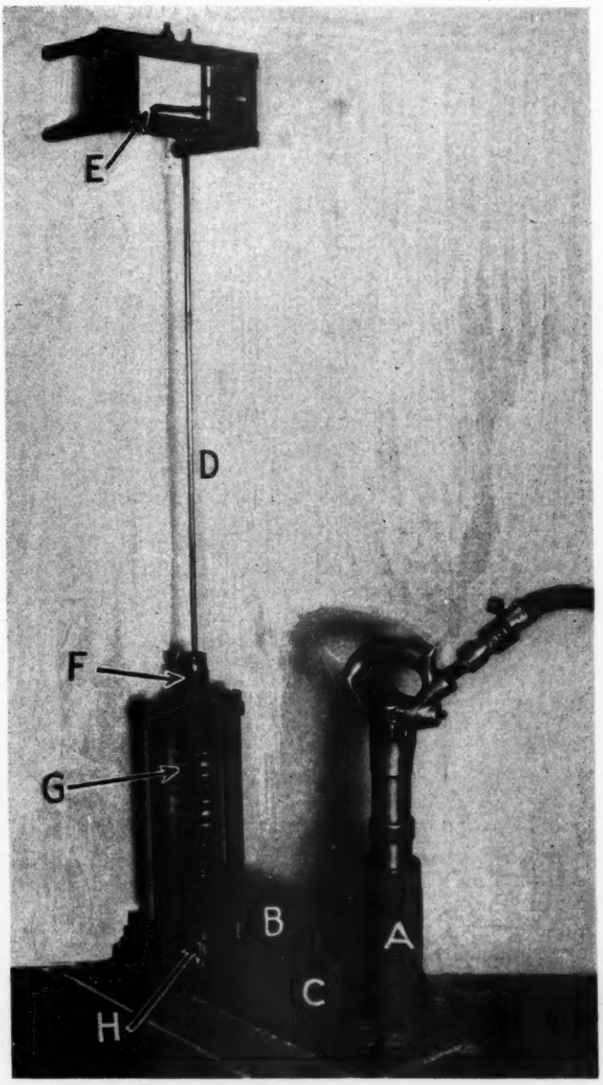
Part *B* is the rocker shaft which takes the blow from the hammer. The end of this rocker, which sets inside of *A*, is equipped with a hardened cone-head anvil. There are three adapters similar to rivet sets that fit chipping and riveting hammers. The other end of *B* is equipped with collars both on top and on the bottom, turned to the inside diameter of the spring.

Part *C* is a jaw which acts as a fulcrum allowing *B* to rock when a blow is struck.

Part *D* is 3-8 in. round rod which operates up and down, being forced down by spring action into the ball seat on *B*. Rod *D* imparts the blow to levers which operate *E*, the lever-holding pencil, and the blow is registered on the card held in the receiver.

Part *F* is an adjusting screw which allows an adjustment on spring *G* to bring it under control so the blow will not operate the pencil beyond the card's capacity. The cards used are 4 in. by 6 in. and with the machine set and adjustment locked, any chipping hammer and the heaviest riveting hammer can be made to register on one card without any change.

Part *H* is a square coil spring which steadies the



Device used on the Michigan Central for testing pneumatic hammers

rebound action of rocker arm *B*. When the hammer is running rod *D* moves up and down very smoothly without any more vibration than a sewing machine.

The mechanism which operates the card consists of a lever fastened to rod *D* and slotted on the opposite end. This slotted end works on a lever on the back of the card receiver which is fastened to the lever-holding pencil. High up on rod *D* is a lever operating a rachet lever on a rachet gear, which is keyed on a shaft having a 16-pitch gear. This gear runs in a rack which is fastened to the card receiver. The rachet gear and 16-pitch gear are kept from vibrating by a fibre brake which is controlled by spring tension. This rachet can be used or not just as the operator wishes.

When the rachet is used, each blow that the hammer strikes moves the card along one or two teeth as desired, giving a series of blows the full length of card. With the ratchet off you get a one line reading anywhere on the card you want. For instance, before a hammer is repaired you can take a reading on the card, then repair the hammer and take a reading right beside the one previously taken and see readily whether the hammer is any better than before.

Testing Devices for Jacks

In view of the discussion that took place at our last convention on this subject it was our earnest endeavor to present a device which would comply with the requirements recommended at that time for testing jacks. We regret to state, however, that with the exception of such devices as used by the manufacturers of jacks to date we have not heard of a railroad which has developed a device that will accurately test jacks so that you can raise the dead load the height of the jack and reverse the load and let it down and then know the jack has raised the load the minimum and maximum according to its tonnage.

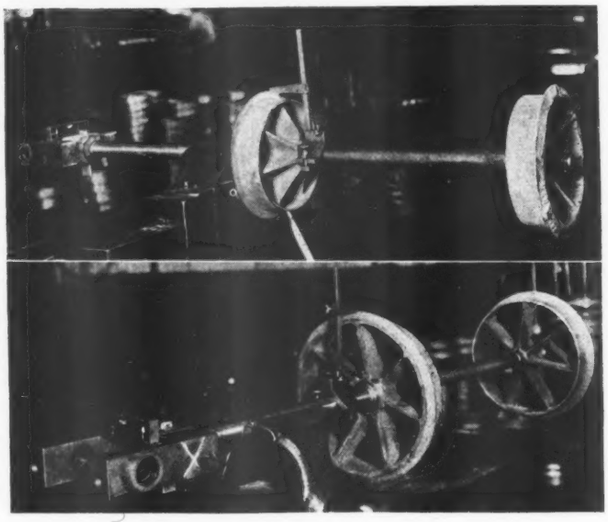
The Santa Fe has designed a new device which it expects will comply with the above requirements, when it has been fully developed. In concluding this report, we want to take this opportunity to express our appreciation to the manufacturers of pneumatic tools and jacks who so gladly co-operated with this committee.

The report was signed by C. B. Heingarten, tool foreman, Chicago & North Western, Chicago, chairman; A. Meitz, tool foreman, Pere Marquette, Grand Rapids, Mich.; E. F. Rhodes, tool foreman, Atchison, Topeka & Santa Fe, Topeka, Kan.; P. C. Hancock, tool foreman, Chesapeake & Ohio, Ironton, Ohio; J. E. Roach, tool foreman, New York Central, Albany, N. Y.

A Centering Gage for Piston Valves

IN assembling piston valves it is essential that the dowel pins on the bottom of the division rings and follower heads be in the center of the valve bushing to prevent the ends of the packing rings from springing into the ports and breaking off. A method using the gage shown in the illustration is an accurate and quick means for locating these dowel-pin holes. In using the gage, the valve stem is clamped in a vise and the crosshead put on, keyed, and leveled. The follower head is put on and keyed in position. The centering gage is then clamped on and plumbed, and the center line scribed.

The tool is made with an inverted vee base which centers it on the valve stem. A clamp fitted with a thumb nut is used to hold the vee-block base in position. A level is mounted on top of the vee and an upright column, to which is attached an adjustable arm,

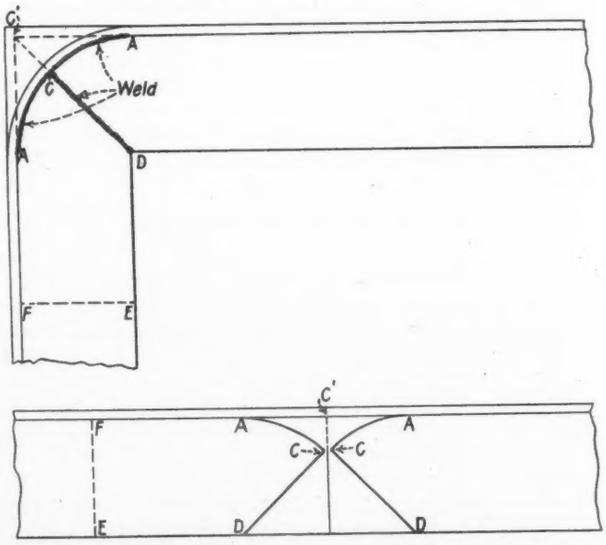


The gage is made with an inverted-vee base

serves as a locater. One side of this arm is in the center of the tool and it is against this side of the arm that the scriber is used to locate the dowel pin holes.

Bending To Radius By Cutting and Welding

TO bend a heavy angle bar or other rolled shape to a specified radius by forging and hammering is a laborious and usually unsatisfactory method. A much



Above: A true view of the bend required and the position of the welds—Below: The piece laid out ready for cutting

easier operation is to cut out the excess metal, leaving one flange intact, then bend, and weld up the incision.

A method of finding the exact cuts needed for the

operation is shown in the drawing. On a sheet of tin or heavy paper draw a true view of the bend required as shown in the upper view in the drawing. With the shears cut out the area *F A C D E*. This will give a template for marking the cuts on the beams.

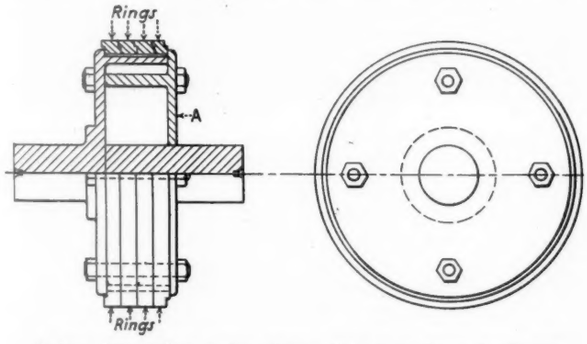
The lower view in the drawing shows the method of marking a beam. The point *C'* is the center of the bend. From *C'* mark off in both directions the distance *CA* as given by the template. Place the template on the work with the point *A* on *A* and mark one side of the cut. Reverse the template and place it on the other side of the center line with *A* again at *A* and mark the other half of the cut. Cut out the area *DCAACD*, bend and weld.

In the example, the radius of the bend is equal to the width of the angle bar being bent. However, the radius may be as desired; but if the throat of the bend is unusally large and the radius correspondingly long. two or more cuts may be necessary as in elbow work. The principle involved would be the same as shown using the rules for laying out elbows.

Arbor For Grinding Valve Rings Circular

By W. H. Wells

ALTHOUGH it is well known that any kind of metal packing ring springs out of round when parted, no provision is made in many railroad shops for machining these rings true after they are cut. To get a valve ring to fit properly by ordinary methods, it is



Arbor for truing valve rings after they have been cut

necessary to spend 10 or 15 min. on each ring, filing, spotting and springing in the ends of each one. Even then the job is not perfect and if the engines are tested carefully for blows on the break-in trip, numerous valves will be reported blowing. In automobile work and other manufacturing, packing rings, after they have been cut, are always ground or turned on an arbor, similar in principle to the one shown in the drawing, which was especially designed to grind the outside of locomotive valve rings.

In using this arbor, the rings are first cut on a power saw in the usual manner, but enough stock is left on the ends of the rings so that when placed in the chamber they will overlap about 1/16 in. thus allowing the stock to true up the periphery. The arbor is designed to handle four rings at a time, which is the usual number on a valve. The rings are placed over the arbor and contracted until the ends come together by a sheet metal band which is placed around them and drawn up by a jacket stud. This roughly centers the rings on the mandrel, and if the follower *A* is slightly tightened the rings may be tapped exactly central. The follower is then drawn tight by the four 7/8-in. bolts, the sheet metal band removed, and the rings ground or turned on the outside.

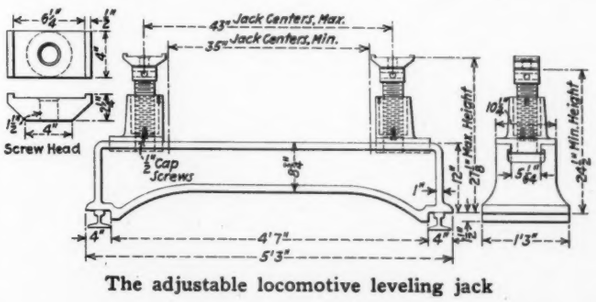
The ends of the rings, which warp out when the ring is cut, although drawn together, are not forced into a true circle by the band, and after being trued up round in the machine will bear against the sides of the valve chamber with equal pressure all around. After the proper opening is given the rings by filing, the job will be nearly perfect.

If the rings are a little too large for the chamber and have too much spring, a good fit may be obtained by turning them down about 1/8-in. larger than the valve chamber before they are cut. This device is not an experiment and shops using it report good results. It is the writer's opinion that it would pay to use it in any shop that has an output of 10 or more engines a month. Adoption of such devices are in line with the present practice of eliminating the uncertain personal equation, and make it possible for specialists and piece-work mechanics to do the same work in less time than was formerly required by the most skillful journeymen.

Locomotive Leveling Jack

IN the illustration is shown a locomotive leveling jack designed for use in the erecting shop. It consists of a bridge 1 ft. 3 in. wide at the base, 10¼ in. wide at the top and 5 ft. 3 in. long, suitable for applying on the rails of the erecting pit. Two jacks are mounted on the bridge which have a maximum center-to-center adjustment of 43 in. and a maximum center-to-center adjustment of 35 in. The bridge is 12 in. high from the top of the rails and the jacks have a maximum height adjustment of 27⅛ in., while the minimum height adjustment is 24½ in.

The bridge frame is of cast steel. The jack bases are of open-hearth steel, while the jack screw is of machine steel, the latter having three Acme threads per inch.



The adjustable locomotive leveling jack

The screw head is 4 in. wide, 7¼ in. long, the maximum frame width which it will accommodate being 6¼ in. It has a free turning fit on the head of the screw, which is slightly riveted over to secure it in place.

ONE HUNDRED YEARS AGO.—Cooper's "Tom Thumb" locomotive, built in America for experimental purposes, was tested on the Baltimore & Ohio on a 26-mile round trip run between Baltimore and Ellicott Mills on August 28, 1830. This trip demonstrated the practicability of the steam locomotive.

NEW DEVICES

Byers Wrought Iron

WITH the formal opening of the new Ambridge, Pa., plant of the A. M. Byers Company, there was introduced a new process of manufacturing wrought iron in units comparable in weight to those possible from an open hearth furnace. The production of steel in the Bessemer converter or the open hearth furnace has been common practice in this country for some 60 years and the production of wrought iron in the puddle furnace has been common for about 150 years. Owing to the fact that the only method heretofore known to produce pure iron has been that involving almost entirely manual labor, the use of this material has necessarily been limited. Under the new process, known commercially as the Byers process, it is expected that a maximum production of 50,000 tons a month can be secured. The increase in productive capacity will permit the extension of this material into the field of rolled plates and will undoubtedly find a wide application in railroad work not only for piping installations in the engineering and mechanical departments but in its application to car construction and bridge and building construction as well.

The opening of the Ambridge plant signifies the practical operation of a process which has been carried on experimentally by the A. M. Byers Company at a small plant in Warren, Ohio. An article which appeared in the May 4, 1929, issue of *Railway Age* outlined briefly the basic process under which the wrought iron was manufactured experimentally on a smaller scale.

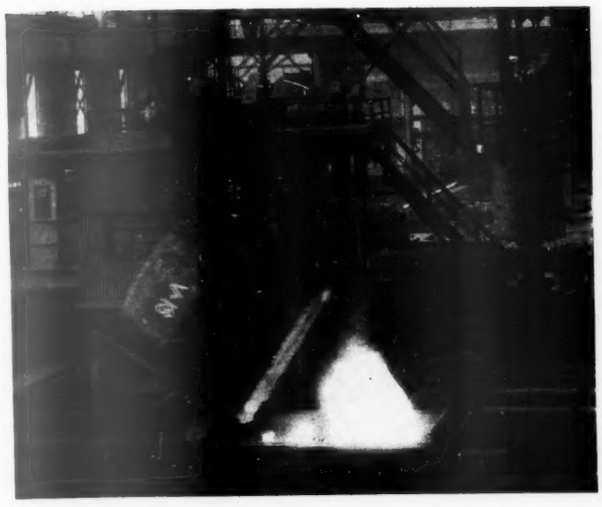
The puddling process by which wrought iron has been manufactured by hand for so many years is carried out in a furnace by which pig iron is converted into practically pure iron by elimination of almost all of the elements, other than iron itself. This pure iron is at one stage granular, and when in this condition, the grains are covered by a bath of slag so that each grain attains a slag coating. The grains are then worked by the puddler into balls and in this form the iron is removed from the furnace. The puddle balls are then put through a squeezer and the resultant "bloom" is rolled out in a mill. As the metal is rolled, the slag that has coated the grains is elongated into thin films which become interspersed in the iron in fiber form.

Processing—The refined iron is being poured into the slag bath

Two 10-ton Bessemer converters remove all other elements from the molten iron

In the Byers process the procedure is analogous in principle, but the manner of achieving objectives is different. Pure iron is obtained by melting pig iron in a cupola and then refining the molten metal in a Bessemer converter. This highly refined iron is carried in ladles to what is known as the "processing platform" where it is carefully poured into processing cups in which is a bath of slag. This slag, the analysis of which is exactly controlled, has been prepared in an open hearth furnace and tapped into the cups. As the molten iron falls through the liquid slag it solidifies into a granular form and, as in the puddling furnace, each grain takes on a coating of slag.

A peculiar phenomenon takes place while the grains of iron are falling through the slag. As the stream of iron strikes the surface of the slag, it breaks into minute globules in the interior of which a gas instantaneously collects. While these globules are descending the gas pressure within them increases to a point where the hollow globules are completely shattered. This phenomenon, the bursting of the shells of the globules, permits the particles of metal to receive a complete coating of



The sponge being poured from the ladle into the squeezer

slag; and, thus, the action which in the puddling process gives wrought iron its peculiar structure, is carried out even to a greater degree in the Byers process.

After sufficient iron has been poured into the slag, the surplus slag is decanted and a ball similar in every respect, except weight, is found in the bottom of the cup. This ball, instead of weighing 200 lb. as in the puddle furnace, weighs from 6,000 to 8,000 lb.

It is apparent that the same reactions that are basic in the hand-puddling process are also basic in the Byers process, and that therefore, while the wrought iron produced by both methods is practically identical, the latter process makes possible a closer metallurgical and chemical control without quantity limitations or exhaustive and arduous labor.

The equipment of the new Byers plant includes a

The 40-ton blooming mill produces billets and slabs

900-ton press for producing blooms about 17 in. by 24 in., a 40-in. blooming mill, a universal plate mill with a capacity for rolling plates 24 in. to 84 in. in width, a skelp mill and a mill for rolling billets into flats, rounds, squares and other merchant mill products.

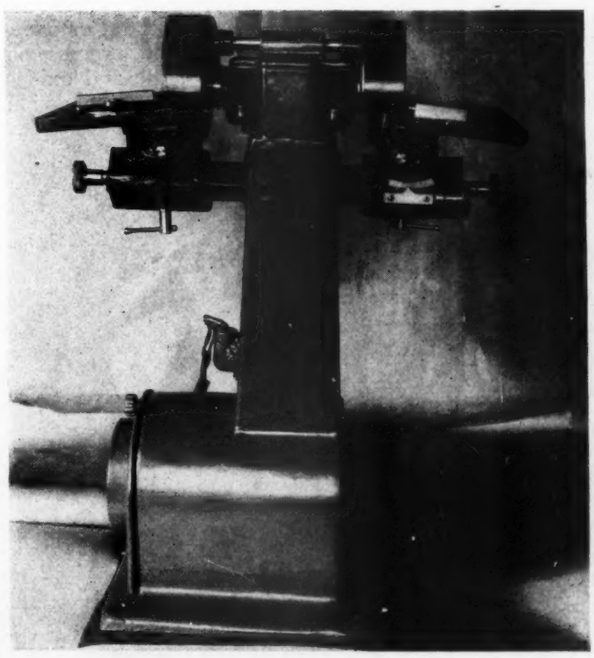
Grinder for Tungsten-Carbide Tools

A *GRINDER* for tungsten-carbide tools has just been placed on the market by the Oliver Instrument Company, Adrian, Mich. It is a double-end grinding machine, mounting two 9-in. cup wheels with 2-in. faces, one on each end of the spindle, which is driven by a 1-hp. motor in the base of the pedestal. The double unit permits the complete grinding of a tool on the one machine without the necessity of changing grinding wheels.

The spindle is of heat-treated steel, running in bronze bearings and is adjustable for wear. The bearings are lubricated from oil wells by means of a wick. The spindle is arranged to give a solid and vibrationless mounting for the wheels that is essential for grinding this metal.

Each wheel of the grinder is equipped with a table which can be adjusted to the wheel by means of hand knobs and locked in position by means of clamping screws. The top of each table has a guide slot parallel to the wheel face with a protractor sliding in this slot to guide the tool accurately to the wheel face. A diamond wheel dresser also slides in the slot to assure the wheel face always being parallel with the tool guide. The tables are graduated to tilt 25 deg. and the wheel guards are adjustable to compensate for wheel wear.

Motor control is of the push-button magnetic type with overload and under-voltage protection arranged for start, reverse and stop. By this arrangement the



The Oliver tungsten-carbide tool grinder

grinding wheels can be run in either direction for grinding right-hand or left-hand tools. Grinding is done free hand, the tool being held against the protractor at the proper angle. The protractor is graduated up to 50 deg. either side of center to insure the accurate grinding of the tool to the exact angle desired.

The machine when shipped is complete ready for operation including motor, grinding wheels, protractor, diamond dresser, belt and starting switch. Its weight is 600 lb.

The Berg Electric Cleaning Tool

THE Concrete Surfacing Machinery Company, Cincinnati, Ohio, has brought out recently a tool of unique design for the removal of paint, rust and scale from steel surfaces. It is designated as the Berg cleaning tool and is adaptable for cleaning steel structures, boilers, coal bunkers, steel cars, locomotive tenders, etc.

The tool employs two cutter bundles of 24 hardened-steel cutters, each with 14 points, which are mounted on each side of a gear housing. This set of cutter bundles revolves at a speed of 2,000 r.p.m., causing the cutters to be thrown outward by centrifugal force and striking the surface being cleaned at the rate of 96,000 times per min. The depth of the cutter contact is regulated by an adjustable depth shoe.

The tool weighs 8 lb., is portable and easily handled. It is made in both electric and pneumatic models, a G.E. universal motor for either 110 or 220 volts being used with the electrical model.

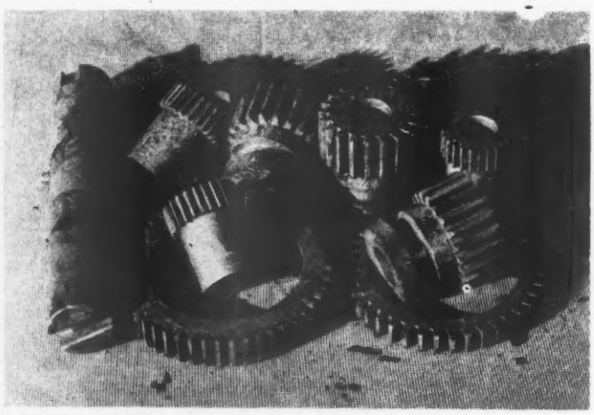
The Berg cleaning tool which utilizes two bundles of 24 steel, 14-point cutters

An Electro-Chemical Cleaning Process

AN electro-chemical metal cleaning method for removing scale and oxides from the surfaces of metals, designated as the Bullard-Dunn Process, has recently been patented by the Bullard Company, Bridgeport, Conn., which is placing the process on the market on a royalty basis. The scale and oxides are removed from the metal surfaces by the action of hydrogen electrically generated on the surface of the metal beneath the scale and oxide.

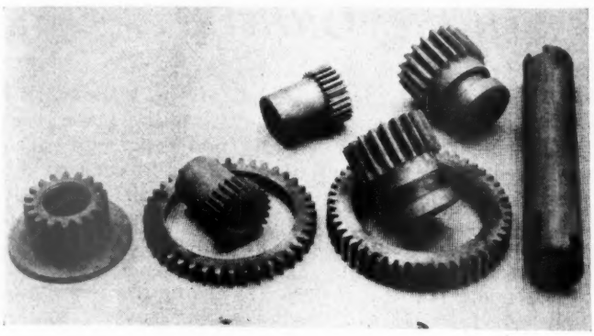
During the cleaning process one and sometimes two immersion baths are used, together with cold- and hot-water rinses. One of the baths uses a caustic electrolyte, the other an acid electrolyte. These solutions are simple in nature, are cheap and may be procured from regular commercial sources. Lead anodes are usually used in the acidic bath, while anodes half of lead and half of iron are used in the caustic bath, the work which is to be cleaned forming the cathodes.

The immersion baths—The metal parts are suspended from the rod in the center while the lead annodes are placed along both edges of the tank



Machine parts before immersion in the electro-chemical baths

The material to be cleaned is first immersed in the caustic bath when grease and dirt are present, otherwise it goes directly to the acid bath. A thin protective metal coating, usually lead, is deposited on the material in both the alkaline and acid baths. If this protective coating is not desired, it can be removed by making the work the anode in the alkaline bath. The current density used in the process is about 60 amp. per sq. ft. of exposed surface at 6 volts.



The parts after being subjected to the process are thoroughly cleansed of dirt, grease and scale

The process does not chemically attack the clean surface of the original metal to cause reduction of bulk by erosion of the surface, regardless of the length of time of its immersion in the electrified solutions. Protection of the surface from pitting, etching and hydrogen embrittlement is accomplished by the metal film, usually lead, which is deposited on the clean surface of the metal as fast as the scale is removed. The process is simple and the ordinary shop man can, after brief instruction, produce consistent results. Metal parts which have become scaled and rusted due to long exposure to atmospheric conditions are readily cleaned, all scale and rust being completely removed easily and economically.

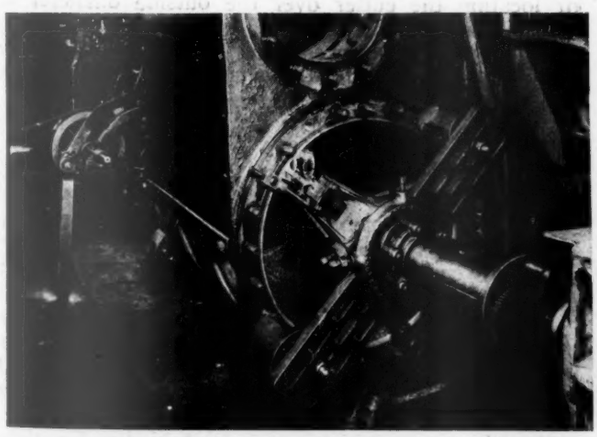
A feature of the process is its ability to reach and clean recessed surfaces otherwise inaccessible to such cleaning methods as sand blasting or wire brushing. It is used for cleaning parts ranging in size from small screws and nuts to finished and hardened gears, shafts, and forgings of all sizes.

A Unique Cylinder-Flange Facing Tool

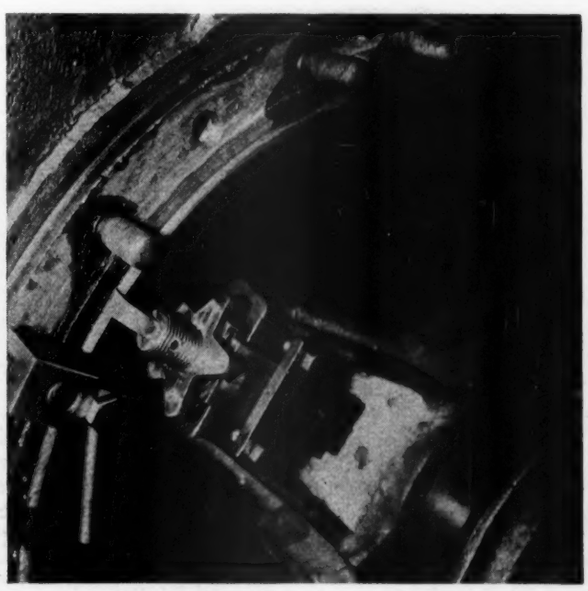
THE facing tool shown in the illustrations is designed to face cylinder and valve-chamber joints or flanges without the necessity of removing the head studs from the cylinder or valve chamber. It is used with a special three-arm cutter head, one arm being specially designed to be fitted with the tool. The remaining two arms are used for boring the cylinder or valve chamber.

The device is inserted in the end of the specially designed arm of the cutter head and is held in position by a clamp. The cutting tool itself is inserted in the square end of a threaded feeding shaft which is actuated by a star wheel. The star wheel is tripped by an extension arm which is fastened on the end of a stationary block screwed on one of the cylinder-head studs. The tripping of the star wheel thus runs the feeding shaft and attached cutting tool outwards at right angles to the boring bar. There is an automatic stop on the feed which can be adjusted to the requirements of each job, thus preventing the tool from feeding past the face of the joint and striking the cylinder-head studs. The cutter head is locked on the boring bar so that no longitudinal feed takes place. If it is necessary to take a longitudinal feed, it can be done by unlocking the cutter head and setting the tool into proper position before again proceeding with the right-angle feed across the face of the joint being machined.

The device, recently marketed by the H. B. Underwood Corporation, 1015 Hamilton St., Philadelphia, Pa., is used in conjunction with the Underwood boring-bar equipment. It is furnished as standard equipment with



The Underwood boring-bar equipped with the special-type cutter head used with the facing tool



The star-wheel feeding arrangement—The flange is machined without removing the cylinder-head studs

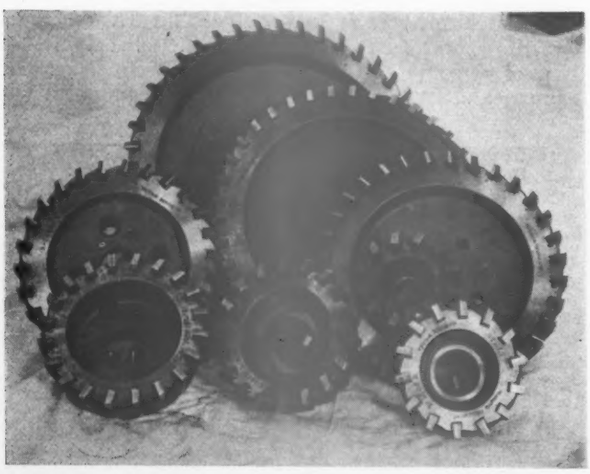
the 24-in. Underwood special cutter head for either a 4-in., 4½-in. or 5-in. boring bar and it will face flanges from 24 in. inside diameter to 32 outside diameter. It can also be supplied in other sizes to face flanges from 16 in. to 20 in. in diameter and from 20 in. to 24 in. in diameter.

Positive-Lock Face-Milling Cutters

A LINE of positive-lock face-milling cutters of the inserted-blade type has been developed by the Kearney & Trecker Corporation, Milwaukee, Wis., for use in production and general-purpose milling. The cutters embody several novel features in milling-cutter design, making them particularly adaptable for accurate milling operations. The cutters are not intended for heavy hogging purposes, but primarily for medium roughing cuts and finishing operations. The blades are so spaced that the cutters are also suited for the milling of surfaces made up of thin, narrow sections.

Two distinct styles are offered, one of which is equipped with high-speed steel blades, and the other with Stellite blades. The only difference embodied in the two styles is in the angular mountings of the blades. These angles have been carefully developed to suit each of the cutting materials, respectively, so that the highest cutting efficiency and longest life between grinds will be attained. The spacing of the blades for both styles is such that ample chip clearance is provided at various speeds, feeds, or depths of cut. The cutters can also be equipped with blades tipped with cemented tungsten-carbide.

The method of mounting the blades is such that a positive lock is attained by means of a hardened and ground tapered wedge designed to eliminate the possibility of having any of the blades work loose

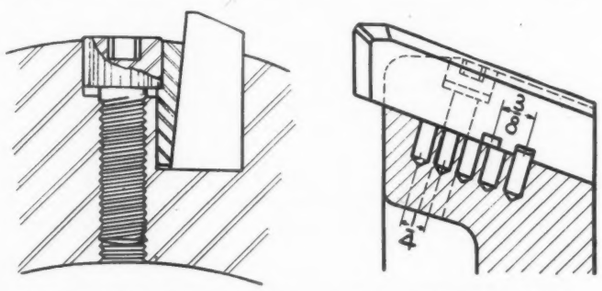


The Kearney & Trecker positive-lock face-milling cutters of the inserted-blade type

while in use. This feature is accomplished by grinding the front side of the blade to a taper that corresponds to the contacting face of the tapered wedge. A screw is used for each blade to minimize the danger of having the blades lift out of place, even though the wedge should loosen slightly.

End slippage is provided against by a set of small pins, one of which is mounted in each of a series of slots of the cutter body and which fits into one of two grooves at the bottom edge of the blade. This construction offers an end support for the blade, preventing the blade from slipping under pressure of a severe cut. The spacings of five holes in each of the slots in the body are ¼-in. apart, and the two slots in the blade are spaced ⅜ in. apart, so that the blades can be adjusted outward in increments of ⅛ in. as the blades become worn.

The bodies of the cutters are made from chrome-nickel steel forgings. After a body has been rough-machined, it is normalized to remove any forging strains that may be prevalent, and then finish-machined and case-hardened. Finally, it is finish-ground on the top and bottom faces and on the mounting fits and then equipped with blades which are in turn ground ready for use. The bodies are made cone-shaped so that the blades are positioned at an angle



The positive-lock arrangement of mounting the blades

to the axis of the body to allow a uniform outside diameter to be maintained as the blades become worn. This uniformity is attained by adjusting the blades outward and then grinding their bottom and peripheral faces to suit.

The locating surface from which the body is attached to the machine spindle is counterbored on all cutters 9 in. in diameter and larger to provide a means of locating the cutter over the outside diameter of the spindle nose instead of location by a centering plug. This design prevents the locating surface from becoming marred while the cutter is being installed or when it is stored and not in use.

When high-speed steel is heat-treated for use as a cutting tool, which includes hardening and drawing, a certain amount of the surface is decarbonized, the depth varying slightly depending upon the temperature of the furnace equipment and the time duration of the heat. Tests have shown, however, that under ordinary conditions small high-speed tools, such as milling-cutter blades, are decarbonized to a depth of from 0.015 to 0.02 in. which naturally has a harmful effect on the cutting efficiency of this portion of the tool. Therefore, unless this decarbonized section is removed after hardening, the tool will not perform as well as one that has had this surface removed.

For this reason high-speed steel blades for these cutters are manufactured with this thought in mind,

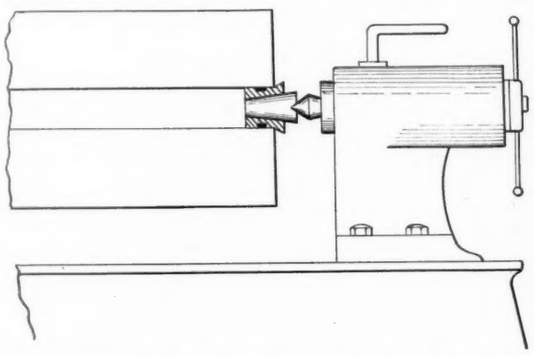
and the front cutting face has 0.025 in. of metal removed after hardening and before assembly to the cutter body.

A feature embodied in the design of the cutters is that the blades are made interchangeably and will fit any size of body. This feature eliminates the necessity of carrying several sizes of blades in stock for bodies of different diameters. However, since the bodies for Stellite and high-speed steel differ slightly, the two types of blades can not be interchanged except with their respective styles of bodies.

The inserted-blade cutters are made in 14 sizes, ranging from 5 to 24 in. in diameter. The 5 in., 6 in. and 7-in. cutters are for use with style C, shell-end mill arbors; the 8-in. cutter is arranged to bolt on the spindle and to be centered by a centering plug; whereas the larger sizes are centered over the diameter of the spindle nose.

Clapp Centering Plugs

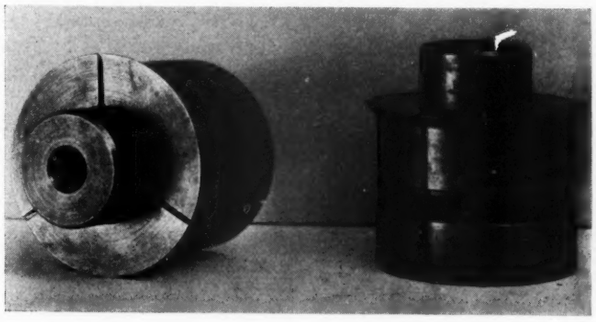
IN the illustrations is shown a centering plug which is designed to hold accurately on centers any form of hollow-bored work, such as locomotive axles, shafts and pins. It is also designed for use on hollow machine



The Clapp centering plug for hollow lathe work

work where no lathe center hole exists. The centering plugs consist of a tapered center which fits into a three-piece expansion unit, the outside surface of which is machined straight to fit the bore of the work which is to be mounted in the lathe. A shoulder machined on the expansion unit is used to hold the plug in place as the tapered piece expands the unit.

The tapered plug is provided with an accurate center as a means for applying the lathe centers. The device will support and carry accurately a pair of locomotive driving wheels mounted on a hollow-bored axle so that the journals, tires or wheel rims can be machined. They



The centering plug in position

are very readily applied and removed. The plugs are finished in ½-in. sizes from 2 in. up and are constructed to expand ¼-in., thus providing ¼-in. sizes.

The tool is designated as the Clapp Centering Plug and is marketed by Arthur E. Claus & Company, Inc., 30 Church street, New York.

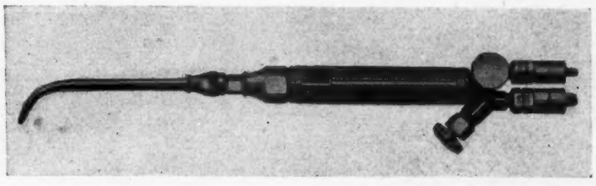
Welding Blowpipe Attachment

OXWELD Acetylene Company, 30 East Forty-second street, New York, has recently introduced new accessories for its Type W-17 welding blowpipe which are designed to make it capable of doing almost any type of work which may be required of an oxy-acetylene blowpipe.

The Type CW-17 cutting attachment enables the blowpipe to do a reasonably wide range of cutting work. A long handle, for operating the cutting oxygen valve, can be pulled forward parallel to the tubes when not in use so that the whole attachment may be carried around in the operator's pocket. The attachment has the same style stem lock nut as the welding head for the Type W-17 blowpipe. The injector for the heating flames is contained in the attachment, just as the injectors are contained in the welding heads. An adjusting screw at the rear of the attachment is regulated by the operator's thumb and forefinger to vary the supply of oxygen for the heating flames while the blowpipe is in operation.

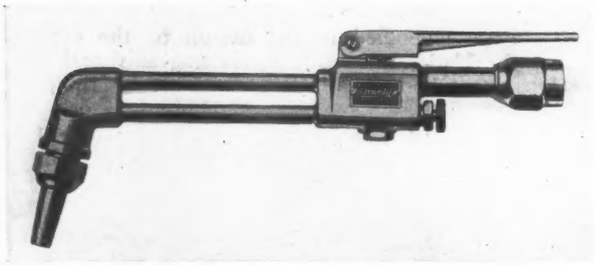
The attachment is joined to the blowpipe handle in exactly the same manner as a welding head; that is, the lock nut can be tightened by hand and no wrench is necessary to join the attachment to the handle.

Another accessory which has just been introduced for use with the W-17 welding blowpipe is the W-17 to W-15 adaptor which makes it possible to use any of the welding heads available for the Oxweld W-15 sheet-



The Oxweld W-17 blowpipe handle with the adaptor and the W-15 welding head

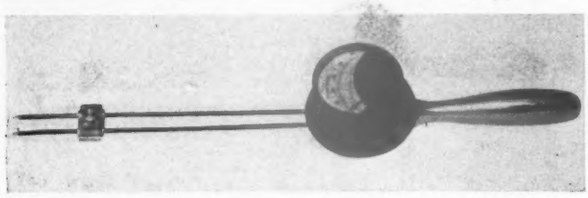
metal welding blowpipe with the Type W-17 welding-blowpipe handle. This means that the W-17 welding blowpipe may be used on work ranging from the lightest type of welding to the heavy general welding work required of such equipment. The end of the adaptor which fits the W-17 blowpipe handle is similar to the rear end of a W-17 welding head. The adaptor contains passages for the oxygen and acetylene which fit tightly against the passages in the blowpipe handle. The other end of the adaptor is exactly the same as the end of a W-15 sheet metal blowpipe handle, so that no more adjustment is required in attaching the W-15 welding head to the adaptor than to a W-15 handle.



The Oxweld CW-17 cutting attachment in operating position

Alnor Portable Pyrometer

A *CONTACT*-type portable pyrometer for measuring the surface temperature of bearings and designated as the Alnor Pyro Prod has recently been developed by the Illinois Testing Laboratories, Inc., 141 W. Austin avenue, Chicago. The unit is adaptable to any soft metal application wherever a surface temperature is desired and is similar to a larger type contact pyrometer which is designed with rigid supporting arms which make it suitable for measuring the temperatures of heated billets of aluminum, brass, zinc or other non-ferrous metals.



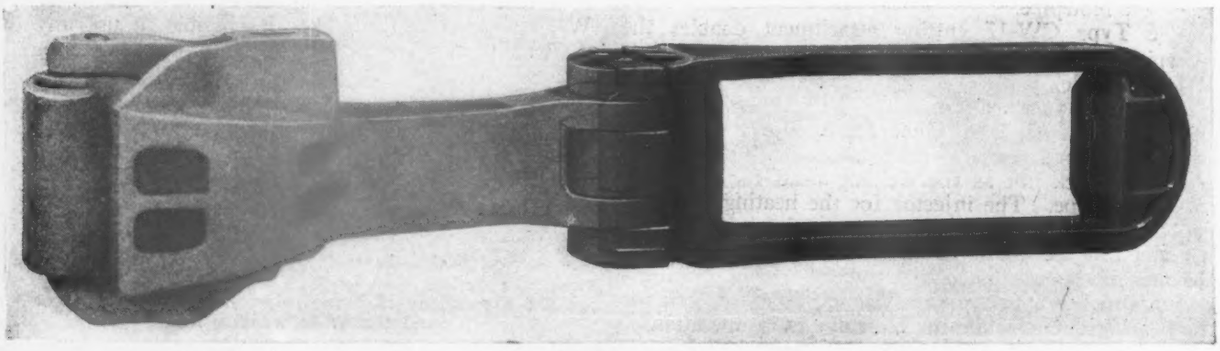
The Alnor Pyro Prod is designed to obtain temperature readings of bearings, heated bars and billets

The operating principle is a thermo-electric pyrometer. It is merely necessary to jab the points of the thermo-couple wire onto the surface of bearings, heated bars or billets and an instant surface reading is obtained, the metal in this case forming the contact between the two thermo-couple wires.

Universal Pivot Yoke

A *UNIVERSAL* pivot coupler yoke, recently developed and placed on the market by the Universal Draft Gear Attachment Company, 332 S. Michigan avenue, Chicago, is designed to overcome weaknesses in the standard horizontal keyed yoke now in general use. The transition from rivet-secured yokes to the cross-key connection was rapid and, although the crosskey provides greater strength than the old form of rivets and permits a quicker exchange of couplers, a serious amount of undesirable slack sometimes develops; further, in curving, the flat butt-end of the coupler against the follower plate causes a twisting and side movement of the follower and yoke and does not at all times allow for full side movement in the striker. The accumulated and progressive slack between the yoke and coupler results in excessive wear on drawbars and other parts which tends to subject the draft gear and attachments to stresses which frequently cause failure.

The Universal pivot yoke has been developed to remedy these conditions. It provides a flexible connection between the coupler and the draft gear and permits movement for the full width of the striker opening. A full flat bearing is presented to the follower at all times and without the wedging action of the ordinary yoke. It is adapt-



Universal pivot coupler yoke developed by the Universal Draft Gear Attachment Company

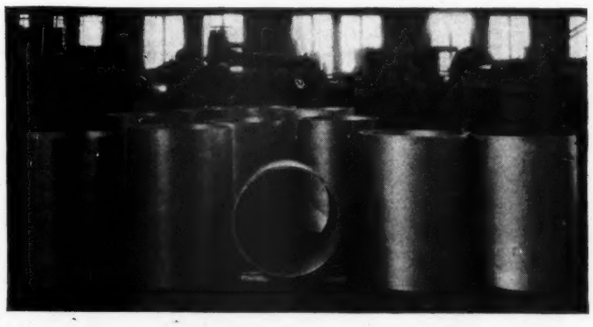
able to any make of coupler and provides a stronger connection without the objectionable slack common to the standard cross-key arrangement. The pivot pin is 2½ in. in diameter, of heat-treated alloy steel. This, with a close fit between the coupler and yoke, insures against any offset of the pin in service, as all buffing shocks are transmitted through these fits, the pins being in action only in draft and then in quadruple shear. Convenient means for removal of the pin is provided as well as for securing it in place by means of sheet metal retainers passed through yoke lugs above and below the pivot pin and bent down on either side to hold them securely in position.

The butt end of the coupler occupies less than the vertical space between the carry iron and the striker, thus permitting the use of the regular striker and carry iron. This feature is said to be peculiar to the Universal pivot type of yoke.

Nickel Cast-Iron Products

CYLINDER castings, cylinder bushings, valve bushings and similar products are now being made of nickel cast iron by the Fulton Iron Works Company, St. Louis, Mo. Recently 400,000 lb. of nickel cast iron was poured into 40 cylinder castings to be used on locomotives of the Canadian National. These castings, weighing approximately 10,000 lb. each and having sections ranging from 2¾ in. to 1¼ in., were cast with a nickel content of .75 to 1.00 per cent and passed a 275-lb. pressure test without a failure. Preliminary tests indicated that the pearlitic structure of nickel cast iron is high and that it is uniform in hardness, strength and toughness. These Fulton products can be made to specifications of the metals shown in the table.

Fultonite No. 1, a nickel-chromium cast iron, is close

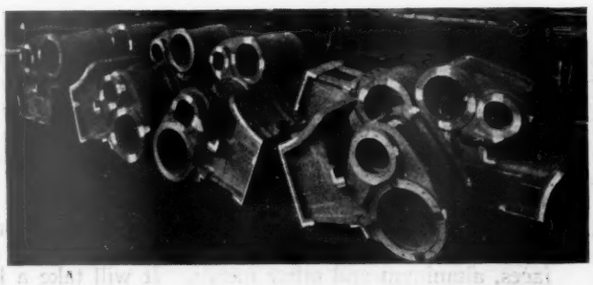


Cylinder bushings of Fultonite No. 1, a nickel-chromium cast iron

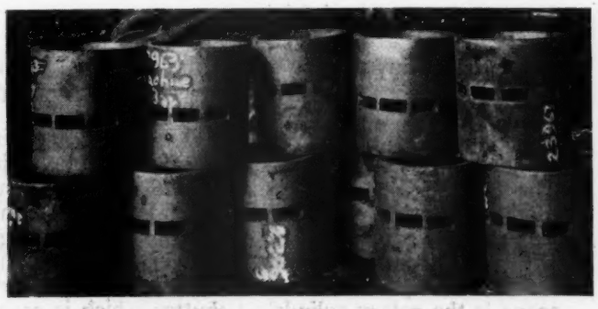
Analysis of Fulton Castings

	Sil.	Sul.	Phos.	Mang.	Nickel	Cr.	Transverse Load, lb.	Deflect.	Brinell hardness	Tensile strength, lb.
Fultonite No. 1*										
Light Castings	2.25	.06	.25	.80	2.00	.30	3,800	.12	190	38,700
Medium Castings	2.25	.08	.70	.70	1.00	.30	4,400	.15	200	41,100
Heavy Castings	1.00	.12	.12	1.25	.75	.40	4,980	.16	270	45,700
Fultonite No. 2†	.75	.06	.12	.70	2.00	.50	4,680	.12	302	45,000
Fultonite No. 3†	1.80	.07	.40	.50	—	12.00	2,900	.05	450	——
Fultonite No. 4†	2.15	.08	.12	.84	1.92	—	5,260	.16	286	50,000
Fultonite No. 5†	1.75	.05	.08	1.00	1.25	.40	4,420	.14	220	42,200
Semi-Steel‡										
Light Castings	2.50	.08	.50	.80	—	—	3,100	.12	—	33,000
Medium Castings	1.50	.08	.70	.70	—	—	3,100	.12	—	33,000
Heavy Castings	1.00	.10	.20	1.25	—	—	3,100	.12	—	33,000
Gray-Iron‡										
Light Castings	2.75	.06	.75	.60	—	—	2,500	.10	—	18,000
Medium Castings	2.25	.08	.70	.70	—	—	2,900	.10	—	21,000
Heavy Castings	1.75	.10	.50	.80	—	—	3,300	.10	—	24,000

* Approximate analysis † Chemical analysis ‡ Approximate chemical analysis.



Cylinder castings of Fultonite nickel cast iron which passed a 275 lb. pressure test without a failure

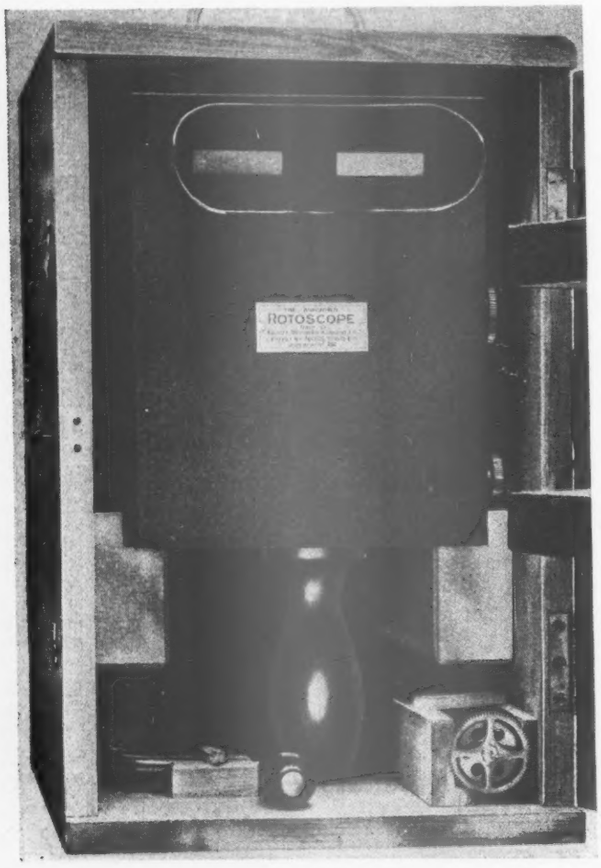


Fulton valve bushings of nickel cast iron

grained, highly resistant to wear and has good machining qualities. Fultonite No. 2 is also nickel-chromium cast iron and has a pronounced resistance to sudden temperature fluctuations and oxidation at high temperatures. Fultonite No. 3 is a cast iron alloy designed primarily for high-temperature uses. Fultonite No. 4 is a close grained alloy which has shown a resistance to high pressures.

Ashdown Rotoscope

THE Ashdown Rotoscope, manufactured in England and distributed in this country by Livingston & Southard, Inc., 17 Battery place, New York, is an instrument operating on the Stroboscopic principle by means of which the observer's vision is "geared up" to



The Ashdown Rotoscope

the speed of any rapidly moving object. Periodic motion, whether rotary, oscillatory, vibratory or reciprocating, can be observed and studied with it, and the exact speed of the moving object can be determined without physical contact of any kind with the object. The Rotoscope actually makes a slow motion camera of the observer's eye, by giving a direct view, without photography. Slow motion study and exact timing at any speed from 100 to 40,000 movements per minute can be accomplished. The chief feature of the Rotoscope is the rotary cylindrical shutter which is capable of giving as many as a thousand glimpses per second, which blend into a continuous impression on the retina of the eye. The speed of this shutter can be varied by rapid adjustments with a tiny five-speed gear box. Fine adjustment speed control is secured by means of a centrifugal governor.

The instrument is compact and light, weighing only six pounds. With it the observer is able to make readings under practically any working conditions and without the aid of special illumination. It is operated by clockwork and requires no electrical connections. The operator holds the instrument in his left hand with the shutter apertures to his eyes and controls the speeds with his right hand. By setting the speed of the shutter at exactly the speed of the moving object, the latter appears to be stationary. Its speed can then be read on the side of the instrument. By increasing or decreasing the shutter speed slightly, slow motion study can be achieved.

The Rotoscope is useful for purposes of synchronization; for the determination of speed losses from friction or slip; for the observation of vibration and deflection; in fact, for the detection and elimination of the many mechanical troubles which hinder rapid production.

Rust-Oy

AS a means of preventing the formation of rust and corrosion on steel and iron, the Williams Alloy Products Company, Elyria, Ohio., represented in New York by the Utilities Accessories, Inc., 230 Park avenue, has developed two products known as Rust-Oy No. 450 and Rust-Oy No. 250, which, while not paints, prevent rust when applied to clean metal and prevent the spreading of rust when applied to metals which have already been partially rusted.

Rust-Oy No. 450 is not a paint and contains no pigments or solids of any nature. It is manufactured from neutralized oils free from acids, treated with chemicals that of themselves are counter-corrosive, into which have been incorporated chemically reduced non-ferrous metals. The metal content of Rust-Oy is in solution and will not settle out regardless of the time it is in storage.

The product is processed to be applied over rust as well as over clean surfaces. Rust-Oy does not remove rust, but penetrates through the rust to the unoxidized surface beneath and leaves a film over the outer surface with an excellent tooth for a finishing coat. By penetrating through rust to the unoxidized surface beneath and waterproofing the unoxidized surface, galvanic action is held at whatever stage it is in at the time of the application of Rust-Oy.

Rust-Oy No. 450 is recommended by its manufacturers for protection of steel that is exposed to the elements and when structures are being repainted. Rust-Oy penetrates into the seams and crevices and between rivet heads and plates, preventing further rusting and corrosive action. It provides a waterproof coating with penetrating value for rusted spots. It is also recommended as an undercoat for all pigment and asphalt paints. The waterproofing qualities of the product also make it adaptable for waterproofing brick, wood, canvas, and other fabrics, composition board, etc.

Rust-Oy No. 250 is especially processed for the prime coat on clean steel, galvanized surfaces, galvanneal surfaces, aluminum and other metals. It will take a hard finish if baked 2½ hours at 200 deg. F., 2 hours at 250 deg. F., 30 min. at 450 deg. F. and 18 min. at 525 deg. F. Rust-Oy No. 250 is not a waterproof coat, but is a primer and should always be applied on clean metal.

Among the Clubs and Associations

RAILWAY CLUB OF PITTSBURGH.—Following dinner at 6 p.m. on November 25 at the Fort Pitt Hotel, Pittsburgh, Pa., the members of the Railway Club of Pittsburgh will be addressed by C. D. Young, general purchasing agent of the Pennsylvania Railroad, on the subject of Railroad Purchasing.

CANADIAN RAILWAY CLUB.—A paper on the Development of the Oil Engine for Railway Service will be presented before the November 17 meeting of the Canadian Railway Club by C. E. Brooks, chief of motive power, Canadian National Railways. The meeting will convene at the Windsor Hotel, Montreal, at 8 p.m.

CENTRAL RAILWAY CLUB OF BUFFALO.—T. V. Buckwalter, vice-president of the Timken Roller Bearing Company, Canton, Ohio, will present a paper on the Timken Locomotive and Roller Bearings for Railroad Use before the meeting of the Central Railway Club of Buffalo which will be held on November 13 at 8 p. m. in the Fillmore Room of the Hotel Statler, Buffalo, N. Y.

NEW YORK RAILROAD CLUB.—The November 21 meeting of the New York Railroad Club, which will be held at 8 p. m. at the Engineering Societies building, 29 West Thirty-Ninth street, New York, will be electrical night. The opening address will be by W. B. Potter, formerly chief engineer of the transportation department of the General Electric Company, Erie, Pa., and H. L. Andrews, chief engineer of the transportation engineering department, will discuss the Contribution of Modern Electrical Equipment to Transportation. Moving pictures will also be shown.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—At 8 p.m. on November 10 at the Great Northern Hotel, Chicago, W. J. McClellan, general shop inspector of the New York Central at New York, will address the Car Foremen's Association of Chicago on the subject of the steam heating of long passenger trains.

The annual meeting of the Association was held at the Morrison Hotel, Monday evening, October 13, over 800 members of the association, with their families and friends, being present. Preceding an excellent program of entertainment and dancing, various committee reports were presented, including that of the secretary, which showed a healthy growth in membership, from 2,513 active members in 1929 to 3,810 active members in 1930. ¶ The activities of the association during the past year have been under the leadership of President F. J. Swanson, district master car builder, Chicago, Milwaukee, St. Paul & Pacific, Minneapolis, Minn. New officers, elected for the ensuing year, include: President, G. R. Andersen, district master car builder, Chicago & North Western, Chicago; first vice-president, Joseph Grimmer, traveling car inspector, Elgin, Joliet & Eastern, Griffith, Ind., and second vice-president, M. E. Fitzgerald, general car inspector, Chicago & Eastern Illinois, Danville, Ill. C. J. Nelson, chief interchange inspector, The Chicago Car Interchange Bureau, Chicago, was re-elected treasurer, and George K. Oliver, passenger foreman, Chicago & Alton, Chicago, secretary.

CAR FOREMEN'S ASSOCIATION OF OMAHA, COUNCIL BLUFFS AND SOUTH OMAHA.—The Relation of the Railroads and the Jacking Industry will be discussed by J. C. R. Rowe, superintendent car shops, Armour & Company, at the next meeting of the Car Foremen's Association of Omaha, Council Bluffs and South Omaha.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—The 1930 annual meeting of the American Society of Mechanical Engineers, which will be held at 29 West Thirty-Ninth street, New York, December 1 to 5, inclusive, will be featured by a series of three lectures on public speaking by Dr. S. Marion Tucker, head, Department of English, The Polytechnic Institute, Brooklyn, N. Y. Other unusual features will be an exhibition of art produced by engineers; a discussion between an economist and an engineer about the parts these two professions play in our present civilization, and a talk by Elliott Dunlap Smith of Yale University who will speak at the annual dinner on Wednesday evening, December 5, on "Engineering Encounters Human Nature." Dr. Tucker's lectures will be held at 8:30 a.m. in the auditorium of the Engineering Societies building on Tuesday, Wednesday and Thursday, December 2-4, and the technical sessions will follow at 9:30 a. m. Of particular interest to railroad officers will be the following:

MONDAY, DECEMBER 1, 2 P.M.
SYMPOSIUM ON INDUSTRIAL ACCIDENT PREVENTION
Economic Aspects of Industrial Casualty Reductions, L. W. Wallace
Engineering Revision—An Essential Factor in Accident Prevention, L. W. Chaney
Management's Responsibility for Industrial Accidents, L. P. Alford
8:30 P.M.
Art and Industry Exhibit

TUESDAY, DECEMBER 2, 9:30 A.M.
MACHINE SHOP PRACTICE (I)
Survey of Surface Quality Standards and Tolerance Costs Based on 1929-1930 Precision-Grinding Practice, R. E. W. Harrison and appendix by C. B. Sawyer
Transmission of Torque by Means of Press and Shrink Fits, J. W. Baugher, Jr.
RAILROAD (I)
Progress Report of Railroad Division
High-Pressure and High-Temperature Steam, C. F. Hirshfeld
The Stug System of Pulverized Fuel Firing on Locomotives, R. Roosen
2 P.M.
INDUSTRIAL POWER
Engineering Aspects of Interchange of Power with Industrial Plants, B. F. Wood
Combined Heat and Power Supply in Industrial Plants, W. F. Ryan (Both represented from World Power Conference)
RAILROAD (II)
Research Relating to the Action of Four-Wheel Freight Car Trucks, T. H. Symington
WEDNESDAY, DECEMBER 3, 9:30 A.M.
STABILIZATION OF EMPLOYMENT IN INDUSTRY
Discussion to be led by Edwin S. Smith
FUELS
Progress Report of Fuels Division, T. A. Mangelsdorf
Heat Absorption of Water-Cooled Furnaces, Wm. L. DeBaufre
Radiant Heat Transmission Between Surfaces Separated by Non-Absorbing Media, H. C. Hottel
GENERAL
Machining Properties of Some Cold-Drawn Steels, O. W. Boston
Frictional Resistance and Flexibility of Seamless Tube Fittings in Pipe Welding, Sabin Crocker and A. McCutchan
2 P.M.
APPRENTICE TRAINING
Apprentice Training in Virginia, C. F. Bailey
Apprentice Training Movement in Wisconsin Industry, Harold S. Falk
6:30 P.M.
Annual dinner. Address by Elliott Dunlap Smith
THURSDAY, DECEMBER 4, 9:30 A.M.
CENTRAL STATION POWER
Operating Experience, Deepwater Station, K. M. Irwin
Operation of the Holland Station, E. M. Gilbert
CUTTING METALS
Tool Steel Tools, A. H. d'Arcambal
Cemented Tungsten Carbide as Applied to Cutting Tools, L. J. St. Clair
Stellite Cutting Tools, E. A. Becker, E. E. Gordon and W. A. Wissler
2 P.M.
BOILER FURNACE REFRACTORIES
Action of Slags on Firebrick and Boiler Furnace Settings, T. A. Klinefelter and E. P. Rexford
Furnace Gas Compositions and Temperatures in Underfeed Stoker-Fired Boiler and Their Effect on Boiler Settings, Albert C. Pasini and Edward M. Sarraf
FRIDAY, DECEMBER 5, 9:30 A.M.
LUBRICATION RESEARCH
On Problems in the Theory of Fluid-Film Lubrication, with an Experimental Method of Solution, Albert Kingsbury
Lubrication Research Activities. Fifth Report of A.S.M.E. Special Research Committee on Lubrication
PROPERTIES OF METALS
Comparative Physical Properties of Chromium-Nickel, Chromium-Manganese and Manganese Steels, C. L. Clark and A. E. White
2 P.M.
MECHANICAL SPRINGS
Elastic and Inelastic Behavior in Spring Materials. Progress Report No. 7 of A.S.M.E. Special Research Committee on Mechanical Springs, M. F. Sayre
Design of a Conical Spring with Coils of a Uniform Slope. Progress Report to A.S.M.E. Special Research Committee on Mechanical Springs, Jos. B. Reynolds and O. B. Schier

Club Papers

Freight Interchange Rules

Chicago Car Foremen's Association.—Meeting held at the Great Northern hotel, Monday evening, September 15. Paper on the subject "Interchange of Freight Equipment," by William J. Owen, chief car inspector, Peoria & Pekin Union, Peoria, Ill. ¶ Mr. Owen, who is well known in freight car inspection circles in the Middle West, extended greetings from the Peoria & Pekin car

men and paid a tribute to the proceedings of the Chicago Car Foremen's Association because of their interest and educational value. ¶Mr. Owen said that, in his judgement, A.R.A. Rule 4 is one of the most important rules connected with the interchange of cars, as well as the most frequently violated, due either to deliberate intent or lack of good judgment. While most of Mr. Owen's comments referred to Rule 4, he also devoted some attention to Rules 36 and 44, concluding his remarks with a plea for the sincere application of the Golden Rule in freight-car interchange.

Combating the Elements

Southern & Southwestern Railway Club.—Meeting held at the Ansley Hotel, Atlanta, Ga., September 18. Papers by I. H. Jones, Pittsburgh Crucible Steel Company and Robert Scott, director of insurance and safety, Atlantic Coast Line. ¶Mr. Jones' paper covered the important steps in the development of the steel industry during recent years, stressing the steel companies' attempts to produce steels with which to combat the destructive elements of nature. In this connection the history of stainless steel was reviewed and the extent to which it has been applied in the industrial field, with special emphasis on the applications of stainless steel in the mechanical departments of the railways, was pointed out. ¶Mr. Jones also discussed the use of nitralloy as applied to the railway industry. This metal is a special analysis steel containing one per cent aluminum. After it is forged, machined and polished, it is placed in a sealed container and hardened by a process of nitriding which consists of forcing ammonia gas under pressure into the container while it is at a temperature of 900 to 1,000 deg. F. This process produces an alloy steel which has a Brinell hardness in excess of one thousand. Up to the present time, Mr. Jones stated, this metal is used for piston rods, locomotive guides, all types of motion parts, Diesel engine crank shafts and other locomotive parts.

Railroads Must Fight

New York Railroad Club.—Meeting held in the Engineering Societies building, 29 West Thirty-ninth street, New York, Friday, October 17. Address by the Hon. Thomas F. Woodlock, contributing editor, *Wall Street Journal* and formerly member of the Interstate Commerce Commission. ¶Mr. Woodlock in a most striking address advised the railroads to cease their internal bickerings, get together and fight against their common enemies. In reviewing the reasons for this advice to the railroads, he pointed out the facts that the traffic which formerly overcame railroad difficulties, can no longer be depended upon; that the railroads' post-war problems were solved by operating economies, but now the traffic department is the key to the problem; that further serious inroads into traffic are threatened by highway, waterway and airway competition; that public sentiment is not unfriendly; that closer attention of the railroads to the rate structure would aid the Interstate Commerce Commission, and that there is less to be gained from railroad individualism than from joint action. ¶Mr. Woodlock stated that he had been greatly disappointed in the past few years at the inability of railroad executives to act together on the really important matters for the larger good of all of them, because they have yielded to the temptation to follow the smaller individual good concerned. He pointed out the fact that store-door delivery was imperative to the success of railroad operation. Pick-up and delivery, he said, must come sooner or later and now is the time to do it. ¶Mr. Woodlock offered the following program for the railroad industry as a whole: Creation of a centralized rate authority and an end to rate "whittling"; a search for low points in the rate structure and application for specific, not horizontal, increases; reduced rates and better service for day-coach travel; store-door collection and delivery of freight; an end to fear of regulatory authority as an obstacle to initiative, and to *fight!—intelligently, under united leadership, all along the line.*

Transportation of Explosives

Railway Carmen's Club of Peoria and Pekin.—Meeting held September 19, 1930, in Room 38, Union station, Peoria, Ill. Paper, on the Regulations for the Transportation of Explosives and other Dangerous Articles, by W. S. Topping, assistant chief inspector, Bureau of Explosives. ¶Mr. Topping's paper was read by W. J. Owen, vice-president of the club in the absence of the author. Mr. Topping reviewed the regulations pertaining to the transportation of explosives and other dangerous articles as prescribed by the Interstate Commerce Commission. These rules affect both carriers and shippers, he said, and it has been the custom since the Bureau of Explosives started active work in 1907 to formulate new regulations only after extended conferences with both interested parties. The co-operative efforts thus utilized, he pointed out, have resulted in regulations which have been generally acceptable to those who have to enforce and comply with them. ¶In conclusion Mr. Topping stated that the regulations have always required that serious violations of the rules, accidents and fires shall be reported through proper sources to the Bureau of Explosives. Information thus submitted is utilized for the purpose of securing correction with respect to future shipments, and ascertaining the causes of fires and explosions.

Roller Bearings on Railway Equipment

Eastern Car Foreman's Association.—Meeting held at the Engineering Societies building, 29 West Thirty-Ninth street, New York, Friday, October 24. Paper by W. S. Spieth, American Steel Foundries, Chicago. ¶Mr. Spieth discussed the extent and effect of stresses on side frames set up by the motion of the railway car truck. He also discussed the development of the roller bearing, following its developments through various stages of machine, automotive and airplane industries. The application of roller bearings to railroad equipment was then dealt with at length. ¶After pointing out the development of the roller bearing in these various industries, Mr. Spieth stated that there has been nothing spasmodic in the development of the railroad roller bearing and its application to railroad equipment. It was the product of natural evolution and was brought about by a combination of a number of factors that for a period developed independently of each other and ultimately united to meet the demands of progress in the railway field. In this connection the developments of the roller bearing itself, the development of alloy steel, the improvements in these alloys and in heat treating, and the art of anti-friction bearing designs were discussed. ¶The advantages of roller bearings in reducing the friction to be overcome while starting a train and keeping it in motion after it is once started and the resultant lower costs of operation was pointed out by the speaker. Aside from this, Mr. Spieth dealt with passenger comfort and the easy operation of trains in cold climates as additional advantages. ¶At the conclusion of Mr. Spieth's address, motion pictures were used to illustrate the assembling of the American Steel Foundries' roller-bearing unit. These showed the machining of the axle, the machining of the housing, the application of the housing, collars, roller-bearing units and oil covers. The handling of the A. S. F. equipment in the ordinary locomotive shop was also shown. The fact was brought out that no more than the ordinary shop equipment is necessary for the removal of the complete unit from under the car, the removal of the wheels, or the machining of the wheels to restore the thread contour.

Air-Brake Developments

Manhattan Air Brake Club.—Meeting held October 17 in Room 2300, 150 Broadway, New York. The Manhattan Air Brake Club discussed nine subjects at its October meeting. These subjects were as follows: Drilling of Bolt Holes in the Supporting Flange of 10-in. Auxiliary Reservoirs, Detached Type; Brake Cylinder Lubricant; 8½-in. Cross-Compound Compressor—Addition of Grooves to the Large Main-Valve Bush; Train Control; A. R. A. Rule No. 167 on Adjustment of Piston Travel; Caboose Valves, New Style; Terminal Train-Brake Tests—Time Required for Detecting Brake-Cylinder Leakage; U-12-BC Universal Valve; Brake Cylinder Protectors. ¶The bolt holes in the supporting flanges of standard freight auxiliary reservoirs, detached type, have always been slotted to provide for variations in installation and interchange. The manufacturers have decided to retain the slotted holes on the triple valve in other reservoirs and to drill the holes in the flange on the opposite end. It is believed that this scheme of drilling the flanges will prevent the reservoirs from working loose and at the same time give

the required clearance. A modification has been made in the large main-valve bushing of the 8½-in. cross-compound compressor by adding four grooves in this bush. This modification was made to eliminate violent vibrations of the piston valves during operation of the compressor. The lack of flexibility with the cut-out cock has prompted some roads to adopt the rotary valve type of caboose valves. The results obtained with this type of valve in service have been reported as satisfactory. ¶In discussing the subject of terminal brake tests, the question was brought up, "What is the common practice of passing on the amount of brake-cylinder leakage during terminal testing to meet Federal requirements?" It was reported that, with sufficient inspectors, a train was tested and checked in three minutes. All cars were found to be satisfactory. However, the same train was checked at the other end of the division. Sixteen minutes were consumed in making this inspection and four of the brakes leaked off in five minutes. It was also brought out that the brake cylinder on the first car leaked off in 40 sec., which would not have been found with the first method of inspection in which only three minutes were consumed.

Advertisement which appeared in the June 9, 1855, issue of the *American Railroad Journal*

Directory

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 5605 Grand Central Terminal building, New York.

AMERICAN RAILWAY ASSOCIATION.—DIVISION V.—MECHANICAL.—V. R. Hawthorne, 59 East Van Buren street, Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey street, New York.

DIVISION I. — SAFETY SECTION. — J. C. Caviston, 30 Vesey street, New York.

DIVISION VIII.—CAR SERVICE DIVISION.—C. A. Buch, Seventeenth and H streets, Washington, D. C.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

RAILROAD DIVISION.—Paul D. Mallay, chief engineer, transportation department, Johns-Manville Corporation, 292 Madison avenue, New York.

MACHINE SHOP PRACTICE DIVISION. — Carlos de Zafra, care of A. S. M. E., 29 West Thirty-ninth street, New York.

MATERIALS HANDLING DIVISION.—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.

OIL AND GAS POWER DIVISION.—L. H. Morrison, associate editor, Power, 475 Tenth avenue, New York.

FUELS DIVISION.—A. D. Black, associate editor, Power, 475 Tenth avenue, New York.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 7016 Euclid avenue, Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce street, Philadelphia, Pa.

AMERICAN WELDING SOCIETY.—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill.

ASSOCIATION OF RAILWAY SUPPLY MEN.—J. W. Fogg, MacLean-Fogg Lock Nut Company, 2649 N. Kildar avenue, Chicago. Meets with International Railway General Foremen's Association.

BOILER MAKER'S SUPPLY MEN'S ASSOCIATION.—Frank C. Hasse, Oxweld Railroad Service Company, 230 N. Michigan avenue, Chicago. Meets with Master Boiler Makers' Association.

CANADIAN RAILWAY CLUB.—C. R. Crook, 2276 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month except in June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 3001 West Thirty-ninth Place, Chicago, Ill. Regular meeting, second Monday in each month, except June, July and August, Great Northern Hotel, Chicago, Ill.

CAR FOREMEN'S CLUB OF LOS ANGELES.—J. W. Krause, 608 South Main street, Los Angeles, Cal. Meetings second Monday of each month except July, August and September, in the Pacific Electric Club building, Los Angeles, Cal.

CAR FOREMAN'S ASSOCIATION OF OMAHA, Council Bluffs and South Omaha Interchange.—Geo. Kriegler, car foreman, Chicago, Burlington & Quincy, Sixteenth avenue and Sixth streets, Council Bluffs, Iowa. Regular meetings, second Thursday of each month at Council Bluffs.

CAR FOREMEN'S ASSOCIATION OF ST. LOUIS.—F. G. Weigman, 720 North Twenty-third street, East St. Louis, Ill. Regular meeting first Tuesday in each month, except July and August, at American Hotel Annex, St. Louis, Mo.

CENTRAL RAILWAY CLUB OF BUFFALO.—T. J. O'Donnell, 1004 Prudential building, Buffalo, N. Y. Regular meeting, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.

CINCINNATI RAILWAY CLUB.—D. R. Boyd, 453 East Sixth Street, Cincinnati. Regular meeting second Tuesday, February, May, September and November.

CLEVELAND RAILWAY CLUB.—F. L. Frericks, 14416 Adler avenue, Cleveland, Ohio. Meeting first Monday each month, except July, August and September, at Hotel Hollenden, East Sixth and Superior avenue.

EASTERN CAR FOREMEN'S ASSOCIATION.—E. L. Brown, care of the Baltimore & Ohio, Staten Island, N. Y. Regular meetings fourth Friday of each month, except June, July, August and September.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S SUPPLY MEN'S ASSOCITION.—J. H. Jones, Crucible Steel Company of America, 650 Washington boulevard, Chicago.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. T. Winkless, Room 707, LaSalle Street Station, Chicago. Next meeting May 5-8, 1931, Hotel Sherman, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabash Street, Winona, Minn.

INTERNATIONAL RAILWAY SUPPLY MEN'S ASSOCIATION.—W. J. Dickinson, acting secretary, 1703 Fisher biulding, Chicago. Meets with International Railway Fuel Association.

LOUISIANA CAR DEPARTMENT ASSOCIATION.—L. Brownlee, 3730 South Prieur street, New Orleans, La. Meetings third Thursday in each month.

MASTER BOILERMAKER'S ASSOCIATION. — A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

MASTER CAR BUILDERS' AND SUPERVISORS' ASSOCIATION.—See Car Department Officers Association.

NATIONAL SAFETY COUNCIL—STEAM RAILROAD SECTION: W. A. Booth, Canadian National, Montreal, Que. William Penn and Fort Pitt Hotels, Pittsburgh, Pa.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meeting, second Tuesday in each month, excepting June, July, August and September. Copley-Plaza Hotel, Boston.

NEW YORK RAILROAD CLUB.—Meetings third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York. Douglas I. McKay, executive secretary, 26 Cortlandt street, New York.

PACIFIC RAILWAY CLUB.—W. S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

PUEBLO CAR MEN'S ASSOCIATION.—I. F. Wharton, chief clerk, Interchange Bureau, Pueblo, Colo.

RAILWAY BUSINESS ASSOCIATION. — Frank W. Noxon, 1124 Woodward building, Washington, D. C.

RAILWAY CAR MEN'S CLUB OF PEORIA AND PEKIN.—C. L. Roberts, chief clerk, Peoria & Pekin Union Railway, 217 Lydia avenue, Peoria, Ill.

RAILWAY CLUB OF GREENVILLE.—Paul A. Minnis, Bessemer & Lake Erie, Greenville, Pa. Meetings third Tuesday of each month, except June, July and August.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Regular Meeting fourth Thursday in month, except June, July and August. Ft. Pitt Hotel, Pittsburgh, Pa.

RAILWAY EQUIPMENT MANUFACTURERS' ASSOCIATION.—F. W. Venton, Crane Company, 836 South Michigan avenue, Chicago. Meets with Traveling Engineers' Association.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md. Next meeting, October 21-23.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, M. P. O. Drawer 24, St. Louis, Mo. Regular meetings, second Friday in each month, except June, July and August.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, June, September and November. Annual meeting third Thursday in November, Ansley Hotel, Atlanta, Ga.

SUPPLY MEN'S ASSOCIATION.— E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division, American Railway Association.

SUPPLY MEN'S ASSOCIATION.—Bradley S. Johnson, W. H. Miner, Inc., Chicago. Meets with Master Car Builders and Supervisors' Association.

TRAVELING ENGINEERS' ASSOCIATION. — W. O. Thompson, 1177 East Ninety-eighth street, Cleveland, Ohio. Next convention March 25 to 28, 1931, Hotel Sherman, Chicago.

WESTERN RAILWAY CLUB.—W. J. Dickinson, 343 South Dearborn street, Chicago. Regular meetings, third Monday in each month, except June, July and August.

NEWS

THE CANADIAN NATIONAL will construct a 10-stall addition to its enginehouse at Edmonton, Alta. A 100-ft. turntable will also be installed.

THE CHICAGO, BURLINGTON, & QUINCY has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of an electric cinder plant at Galesburg, Ill.

THE BALTIMORE & OHIO has contracted with the Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa., for the erection of a water treating plant at Connersville, Ind.

THE CHESAPEAKE & OHIO has awarded to J. A. Fix & Sons, Lynchburg, Va., a contract amounting to $153,460 for improvements to its locomotive shops at Clifton Forge, Va.

THE NEW YORK, NEW HAVEN & HARTFORD has recently authorized the installation of additional fire protection for its car and locomotive shops at Readville, Mass., at a probable cost of $35,000.

THE GULF, MOBILE & NORTHERN is preparing plans for the construction of a terminal at New Orleans, La., to cost $1,250,000. The facilities to be installed include trackage, an enginehouse, a car repair shop and a machine shop for locomotive repairs.

THE UNION RAILROAD has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 200-ton automatic electric reinforced concrete coaling station, sand drying and storage plant and electric cinder plant at Munhall, Pa. The same contractor will construct a reinforced concrete coaling station, sand plant and cinder plant at Rankin, Pa. The total cost of both projects will be $60,000.

A SUMMARY of world progress in the field of iron alloys, advance in which is held to be fundamental for American industry, is on the object of a program of research enlisting the co-operation of more than sixty industrial and scientific organizations and corporations of the United States under the leadership of the Engineering Foundation. A fund of $230,000 to make possible a review of all available literature has been contributed by the co-operating organizations. Five years will be required to complete the program.

PERE MARQUETTE has awarded a contract for the installation of a new turntable and the extension of the turntable pit at Grand Rapids, Mich., to the Barnes Brothers Construction Company, Grand Rapids, at an approximate cost of $78,000. Another contract has been awarded to the Roberts & Schaefer Company, Chicago, for the installation of locomotive coaling equipment at Grand Rapids, and a new water treating plant will be constructed at Wyoming Yard, Grand Rapids, by the Nelson Water Service Company, Chicago, the latter at a cost of $50,000.

B. & M. Makes Peace With New Hampshire

THE SUIT of the State of New Hampshire against the Boston & Maine for alleged violation of the New Hampshire law by removing or threatening to remove repair shops from that state is to be withdrawn. Officers of the road and of the state have agreed that the legislature shall be requested to make a new law, requiring simply that repair and construction work in the locomotive and car departments shall be done in New Hampshire in proportion to the locomotive and car-miles operated in that state as compared with such operations on the whole of the railroad company's system. The road proposes to expend $450,000 for the modernization of its shops at Concord, N. H., which will be followed probably by the employment of 125 additional men at those shops.

Three Engine Districts St. Paul to the Coast

THE NORTHERN PACIFIC has established one of the longest locomotive runs in the United States with the operation of its transcontinental passenger service between St. Paul, Minn., and the Pacific coast with only three engine districts. The longest of these is between Jamestown, N. D., and Missoula, Mont., 904 miles. The other two districts: namely, between St. Paul and Jamestown and between Missoula and Seattle, Wash., are 344 and 656 miles in length, respectively. Locomotives of the 4-8-4 type, which have a tender capacity of 24 tons of coal and 15,000 gal. of water, are being used in this service. The new district between Jamestown and Missoula eliminates engine changes at Glendive, Mont., and Livingston. Five years ago there were 13 engine districts on the 1,904 miles between St. Paul and Seattle.

Measuring Safety by the Railroad Standard

The paper by Robert Scott, director of insurance and safety, Atlantic Coast Line, which was also read at this meeting, gave an analysis of the meaning of safety and its manifold advantages. ¶For quite a while it was his belief, Mr. Scott stated, that organized safety committees, with representation from each branch of the service, looking for and reporting dangerous conditions and unsafe practices, would solve the problem of employee personal injuries, when coupled with periodical safety rallies to provide inspiration. However, something was lacking in such an organization and, according to Mr. Scott, that something is pressure from the top; that is, the chief executives of the railroads must make it known in no uncertain terms that they want safety in operation and are willing and anxious to do everything within reason to promote it.

B. & M. Adopts New Employment Policy

THE BOSTON & MAINE has announced a new policy of employment by which jobs for approximately 200 additional men will be created at various locations on its system. This step to relieve unemployment, agreed upon by the railroad and the Boston & Maine Mechanical Employees Association, at the suggestion of the latter, will eliminate seven-day jobs in the mechanical department without increasing the expense of the railroad and will bring in new men on five- and six-day schedules. The policy will affect machinists, boilermakers, electricians, car repairmen, mechanical inspectors and related employees, and is to be worked out immediately at Boston, Lawrence, Lowell, Ayer, East Deerfield, Worcester and Springfield, Mass.; Concord and Woodsville, N. H.; White River Junction, Vt., and Mechanicville, N. Y.

In carrying out the agreement it is understood that due consideration will be given to the requirements of the service, the necessity of maintaining a well-balanced force and the competency of the employees who are to fill such new positions as are created by the change.

New Record for Fuel Economy

CLASS I RAILROADS in the first six months of 1930 obtained the greatest efficiency for any corresponding period on record in the use of fuel by road locomotives, according to reports filed by the railroads with the Interstate Commerce Commission. An average of 125 lb. of fuel was required to haul 1,000 tons in freight service, including locomotive and tender, a distance of one mile, the lowest rate ever attained since the compilation of these reports began in 1918, being a reduction of 4 lb. under the best previous record established in the first half of 1929. Record efficiency also marked the use of fuel in the passenger service an average of 15-lb. having been required to move each passenger train car one mile compared with 15.3 lb. in the first six months in the preceding year.

Class I railroads in the first half of 1930 used for road locomotive fuel 50,916,925 tons of coal and 1,189,018,040 gallons of fuel oil.

B. & O. Car Building Plans Provide Employment

THE BOARD OF DIRECTORS of the Baltimore & Ohio at a recent meeting authorized a car building program in anticipation of future requirements and with the desire to provide employment for men whose service would not otherwise be required during the fall and winter. The program calls for construction of 1,000 steel box cars and 1,000 heavy service gondola cars at a total cost estimated at $4,000,000.

It is understood that the work will be carried out in the Baltimore & Ohio shops or by manufacturers who will engage Baltimore & Ohio employees. One-half of the work will be done at Baltimore and the other half at shops along the line of railroad.

It is estimated that in the erection shops alone this work will give some 60,000 or 70,000 man-days employment. This will not only provide work for Baltimore & Ohio employees, but a large amount of steel and other material used in the construction of these 2,000 cars will contribute to employment in other industries, the announcement says.

Arc Welding Competition

A SECOND ARC WELDING prize competition, the purpose of which is to stimulate designers and engineers in every line of industry to think of the manufacture of their own products by the use of arc welding and to increase their knowledge of the feasibility of its application, has been announced by the Lincoln Electric Company, Cleveland, Ohio. Seventeen thousand five hundred dollars will be awarded for the forty-one best papers submitted, and the Jury of Awards, who will judge the papers, will be composed of the Electrical Engineering Department of the Ohio State University under the chairmanship of Prof. Erwin E. Dreese, head of the department, and such others as he may select. The competition will close on October 1, 1931. The rules under which it will be conducted have not yet been announced.

Domestic Orders Reported During October, 1930

Freight Cars

Name of Company	Number ordered	Type	Builder
Maine Central	5	Hopper	Standard Steel Car Co.
Chicago Great Western	500	Box	Pullman Car & Mfg. Co.
Baltimore & Ohio	1000	Box	Standard Steel Car Co.
Hercules Cement Corp.	10	Cement	Standard Steel Car Co.
Minneapolis, St. Paul & Sault Ste. Marie	200	Box	Company shops
Chicago, Rock Island & Pacific	51	Gondola	Company shops
	25	Caboose	Company shops
Pennsylvania	1500	Gondola	Company shops
Total for month	3291		

Locomotives

Name of Company	Number ordered	Type	Builder
Coos Bay Lumber Company	1	2-8-2	American Locomotive Co.
Chicago Great Western	6	2-10-4	Lima Locomotive Works
Total for month	7		

M-K-T Headquarters Controversy

THE MISSOURI-KANSAS-TEXAS was authorized by the Railroad Commission of Texas, on October 3, after more than a year's deliberation, to utilize its Waco shops in rebuilding locomotives, but was denied the right to move division headquarters from Smithville to Waco. The application for authority to discontinue the offices at Smithville and do all general repairing and overhauling of locomotives at Waco was made in September, 1929, the petition receiving the support of the Waco Chamber of Commerce and being vigorously opposed by Smithville citizens.

In 1924 the railroad announced its intention of moving its offices but was prevented by the state commission whose authority was upheld by the court which decided that the commission, under the contract, had entire jurisdiction over any contemplated move. The commission has found that the shops at Smithville are adequate for running repairs, that the Waco shops are more adequately equipped for overhauling, that the type of locomotives now used by the railroad as compared to the type in use in 1924 cannot be efficiently rebuilt and overhauled at Smithville and that the interest of the railroad and the general public will best be served by requiring the division superintendent, his staff and clerical forces to be continued at Smithville.

Equipment Installed

CLASS I RAILROADS of the United States in the first eight months of 1930 placed 64,418 new freight cars in service, the Car Service Division of the American Railway Association has announced. In the same period last year, 51,680 new freight cars were placed in service.

Of the total 33,135 were box cars, an increase of 8,409 compared with such installations in the first eight months of 1929. There were also 24,380 new coal cars as compared with 18,136 installed during the same period last year. In addition, the railroads in the eight months period this year installed 3,225 flat cars; 2,650 refrigerator cars; 727 stock cars, and 301 other miscellaneous cars. The railroads on September 1 this year had 12,166 new freight cars on order compared with 31,898 cars on the same day last year and 9,257 on the same day two years ago.

The railroads also placed in service in the first eight months this year 561 new locomotives compared with 474 in the same period in 1929. New locomotives on order on September 1 this year totaled 235 compared with 395 on the same day last year. Freight cars or locomotives leased or otherwise acquired are not included in the above figures.

Texas & Pacific Opens New Big Spring Terminal

OFFICERS from all departments of the Texas & Pacific attended the formal opening last month of a new locomotive terminal at Big Spring, Tex. This is the third large modern terminal project completed by that road within the last three years. The facilities include a 22-stall enginehouse, Whiting drop tables, hot-water washing facilities and a Direct Steaming System operated in conjunction with a high-pressure steam plant, equipped with two 600-hp. Union water-tube boilers.

With the acquisition of super-power locomotives and the modernization of its locomotive terminal facilities, the Texas & Pacific recently attained the highest car-mile per car-day average recorded by Class I railroads and one of the lowest fuel consumption records per 1,000 gross ton-miles. Officers of that road point to the fact that every ton of through freight is being handled by modern Texas and Santa Fe type locomotives, equipped with superheaters, feedwater heaters, limited cut-off, boosters, etc. With the completion of the new Big Spring terminal, all of these locomotives are refilled and steamed on each round trip at terminals equipped with the latest facilities for the prompt and efficient handling of power.

Longer Locomotive Runs on the C. P. R.

LOCOMOTIVE RUNS will be greatly lengthened on the western end of the Canadian Pacific, it was stated in Vancouver recently by W. M. Neal, general manager, western lines.

Following an experiment conducted

with great success last spring, when the Canadian Pacific locomotive number 2808 was operated from Fort William to Calgary over nine divisions, hauling a transcontinental passenger train in scheduled time, and retracing the 1,252 miles with another regular passenger train, the company is preparing to extend the system whereby locomotives will pull trains over several divisions instead of over a single division as at present, Mr. Neal said.

When the system of longer runs is put in effect across the whole of the main line between Fort William and Vancouver, it was pointed out, only five locomotives instead of fourteen will be used to haul a train over that distance. In other words, Mr. Neal explained, one locomotive will operate through from Fort William to Winnipeg; another from Winnipeg to Calgary; another from Calgary to Field; another from Field to Revelstoke, and a fifth from Revelstoke to Vancouver.

This would avoid changes at Ignace and Kenora, Ont.; Brandon, Man.; Broadview, Moose Jaw and Swift Current, Sask.; Medicine Hat, Alta., and Kamloops and North Bend, B. C.

Pennsylvania to Build 1,500 Freight Cars

NEARLY 600 Pennsylvania employees, most of whom have been on furlough, will begin work soon on the construction of new steel cars costing about $5,000,000. All of these new cars will be built in the Pennsylvania's own shops.

The five million dollar order involves the immediate construction of 1,500 steel gondola cars 65 ft. long with a carrying capacity of 74 tons each, being especially designed for transporting structural steel, pipe, and open shipments of automobiles. Construction of the 1,500 cars will require 93,000,000 lb. of steel and steel products.

Five hundred of the new steel cars will be constructed at the Pennsylvania's Enola street car shops near Harrisburg, 500 at the Pitcairn steel shops, Pittsburgh district, and 500 at Altoona Works, at Altoona, Pa. Three hundred men now on furlough will be called back to work at the Enola and Pitcairn shops, and approximately 150 men will continue full time on the construction schedule at the Altoona Works. In addition, 137 men will be placed on an approximately full-time schedule in the fabricating shops in connection with the new car order.

The assembly of material is being started at once and it is expected that fabrication will be undertaken within the next few weeks. Delivery of cars for service is expected to be started at the rate of approximately 20 a day.

High Monthly Passenger Locomotive Mileage

THE CHICAGO & EASTERN ILLINOIS has averaged more active passenger locomotive miles per month for the first six months of 1930 than any road serving the Illinois-Indiana territory, according to J. B. Ford, vice-president of the road.

In comparing the average miles per active locomotive in service per month of a number of roads serving the Illinois-Indiana territory for the first six months of 1930 and the corresponding period of 1929, Mr. Ford said that the fact that the Chicago & Eastern Illinois ranks first is shown in the following figures:

Average Miles Per Month

	1930	1929
Chicago & Eastern Illinois...	7,868	7,151
Chicago, Indianapolis & Louisville	6,362	6,173
Wabash	6,096	6,029
Cleveland, Cincinnati, Chicago & St. Louis	5,835	5,702
Chicago & Alton	5,608	5,836
Pennsylvania	5,298	5,193
Illinois Central	4,693	4,771

"As a matter of fact," said Mr. Ford, "there are only eight Class I railroads in the United States to equal or exceed 7,000 miles per month per active passenger locomotive during the first six months of 1930. The Chicago & Eastern Illinois ranks fourth among these eight roads."

Figures on the first four roads in the United States are as follows:

Average Miles per Month

	1930	1929
Union Pacific	8,709	8,436
Florida East Coast.....	7,900	7,750
Missouri-Kansas-Texas	7,895	7,680
Chicago & Eastern Illinois...	7,868	7,151

The Michigan Central is fifth; Richmond, Fredericksburg & Potomac, sixth; Atchison, Topeka & Santa Fe, seventh; and the Los Angeles & Salt Lake, eighth.

While discussing the winter passenger service, Mr. Ford said:

"With the gradually improving business conditions, it is expected that the coming winter tourist season in Florida and along the Gulf Coast section will be the best in several years."

Taking coal on the Michigan Central near Michigan City, Ind.

Seek Order on Automatic Connectors in Canada

AT A HEARING which occupied the entire week ended October 24, the Canadian Board of Railway Commissioners heard the plea of various railway employees' organizations for an order to make compulsory the installation of automatic train line connectors. C. P. Riddle, general secretary of the Canadian Railway Association, told the Board that tests of automatic connectors are at present being carried out at Purdue University under the direction of the American Railway Association in collaboration with the Bureau of Safety of the Interstate Commerce Commission and the Brotherhood of Railroad Trainmen.

A. C. Boyce, appeared for the Brotherhood of Railway Trainmen. Outlining the attitude of that organization toward the matter, he recalled that, in 1926, attention of the railways had been drawn to it while subsequent efforts had been made "to get to a point where this protection could be afforded." Up to date, however, nothing definite had resulted with the exception of one device, tested in February, 1929, which had failed to live up to the expectation of all concerned.

Mr. Boyce gave figures to show the loss of life among railway employees and injuries sustained in the duty of coupling and uncoupling trains. The Brotherhood insisted upon action by the Board. The delay on the part of the railways in installing such safety devices as automatic trainline connectors was unreasonable, Mr. Boyce said.

Mr. Riddle stated that tests were begun at Purdue University on September 29. Forty devices had been submitted. It would require one more year to arrive at any result. Up to the present, no automatic trainline coupler had been invented that would meet all conditions. Mr. Riddle emphasized the tremendous variations which an invention of this character would have to meet in order to be applicable to various conditions and to all railways.

There had been no unreasonable delay, he said, inasmuch as time was needed in order to equip the laboratories for the many tests that such devices would have to undergo.

The Canadian railways would be willing to adopt any such satisfactory device if standardization on all American railways could be achieved.

Mr. Boyce contended that the Purdue University experiments were "nothing more than a gesture, with the idea of delaying the testing out of mechanical devices for many years." He objected to Canadian railways being subjected to the decisions reached at "a foreign university."

W. A. Newman, chief mechanical engineer of the Canadian Pacific observed that the C. P. R. had conducted many experiments on its own initiative; but these had had to be done on sections of line which were isolated and where the cars were not interchanged with other railways.

Supply Trade Notes

THE STANLEY H. SMITH COMPANY Cleveland, Ohio, has moved its offices from the Rockefeller building to suite 922 Midland Bank building.

THE WORTHINGTON PUMP & MACHINERY CORPORATION, New York, has acquired the Gilman Manufacturing Company, East Boston, Mass.

C. R. ROBINSON, of Chicago, vice-president of the Inland Steel Company, has been appointed an executive member of the Railway Business Association.

B. E. MERCER, general superintendent of the Union Steel Casting Company, subsidiary of the Blaw-Knox Company, Pittsburgh, Pa., has been elected a vice-president of the company.

L. L. CASKEY, assistant manager of the strip steel division of the Republic Steel Corporation has been appointed assistant manager of sales for the Philadelphia, Pa., district.

W. W. WELLER has been appointed New England sales manager of the Adirondack Steel Foundries Corporation, Watervliet, N. Y. Mr. Weller's office in the Park Square building, Boston, Mass.

THE MILWAUKEE ELECTRIC CRANE & HOIST CORPORATION, Milwaukee, Wis., has consolidated its Cleveland, Ohio, office with that of the Harnischfeger Corporation, the parent company, at 342 Rockefeller building.

THE ACHESON GRAPHITE CORPORATION, a unit of the Union Carbide & Carbon Corporation, since November 1, has had its entire line of Gredag lubricants distributed and sold by the Carbon sales division of the National Carbon Company, Inc., Cleveland, Ohio.

THE REPUBLIC STEEL CORPORATION has consolidated its western and Chicago district sales offices, and has placed H. S. Schoeder, western manager of sales, in charge. C. S. Powers has been appointed district manager of the corporation with headquarters at Tulsa, Okla.

KENNETH C. GARDNER, for the past several years vice-president in charge of sales of the Greenville Steel Car Company, Greenville, Pa., has resigned. Previous to his service with the Greenville Steel Car Company, Mr. Gardner was manager of sales for the Pressed Steel Car Company, at Pittsburgh.

THE J. S. COFFIN, JR., COMPANY is now located in its new plant at Englewood, N. J. The new building is of steel and brick construction, and modern in every detail. In this plant the manufacturing, assembling, testing, stores and shipping departments of the company will be concentrated.

H. B. NELSON has become associated with the Prime Manufacturing Company, Milwaukee, Wis., in a sales and service capacity. Mr. Nelson formerly was shop superintendent of the Chicago & Alton and prior to that general boiler foreman of the Missouri Pacific.

CLIFFORD S. STILWELL has been appointed sales manager of the Warner & Swasey Company, with headquarters at Cleveland, Ohio. Mr. Stilwell has been associated with the Warner & Swasey company since his graduation from Denison University in 1912. He began as a special apprentice in the works at Cleveland and, in 1915, following two years as a representative in the Chicago and Detroit offices, he was appointed district manager, with headquarters at Detroit, Mich.

C. S. Stilwell

THE STAR HEADLIGHT & LANTERN COMPANY, Rochester, N. Y., according to a statement of President Albert W. Jacobs, has purchased the rights and property of the Loco Light Company, Indianapolis, Ind., and will transfer the plant to Rochester.

THE CHICAGO HEADQUARTERS of The J. G. Brill Company are now located in the Harris Trust building. The activities of the electric railway and automotive car divisions of the company for the district are now under the direction of Walter J. Cummings, who was recently elected a vice-president.

THE NATIONAL LOCK WASHER COMPANY has added a new modern four-story reinforced concrete building, with a floor area of 50,000 sq. ft., to its plant at Newark, N. J., to provide additional facilities primarily for the manufacture of car window equipment and for the machining of drop forgings.

CHARLES W. PENDOCK, president of the Le Roi Company, Milwaukee, Wis., has been elected a director of the Independent Pneumatic Tool Company, Chicago. The Le Roi Company furnishes the gasoline engines which are used in the Thor portable air compressors manufactured by the Independent Pneumatic Tool Company.

THE PAIGE & JONES CHEMICAL COMPANY, New York, has sold to The Permutit Company, New York, the Zeolite and lime-soda water softening and filter departments of its business including machinery, inventories, patterns and drawings. The Paige & Jones Chemical Company will continue the chemical branch of its business.

CHARLES B. NOLTE, vice-president and general manager of the Robert W. Hunt Company, has been elected president and general manager, with headquarters at Chicago, succeeding John J. Cone, resigned, and J. C. Ogden, director and eastern manager, has been elected vice-president, with headquarters at New York.

LLOYD R. WELLS has been appointed special railroad representative of the Babcock & Wilcox Tube Company Beaver Falls, Pa. Mr. Wells was formerly district manager of the Carbon Steel Company in New York and before that the Chicago representative of the Midvale Steel Company.

J. H. WILLIAMS & COMPANY, Buffalo, New York, will consolidate its general office and main sales office (exclusive of sales of special drop-forgings to order), with its present eastern sales office and warehouse at 75 Spring street, New York, after October 1, 1930. A service department will be retained at Buffalo to represent the sales department at the factory in giving special attention to the orders of customers and of the New York and Chicago warehouses.

THE J. G. BRILL COMPANY, of Philadelphia, Pa., and the Cummings Car & Coach Company, Chicago, have entered into a plan of affiliation whereby the Brill Company will center its manufacturing for the western district in the plant of the Cummings Company at Paris, Ill., Walter J. Cummings, president of the Cummings Company has been made a vice-president and director of the Brill Company and will have charge of western operations.

THE INDEPENDENT PNEUMATIC TOOL COMPANY, 600 West Jackson boulevard, Chicago, announces the following personnel changes in its organization: W. A. Nugent, manager of the St. Louis office will be transferred to Chicago as manager of the Chicago territory; F. J. Passino, manager of the Pittsburgh office will be located at St. Louis, as manager of that territory; T. J. Clancy of the Cleveland office will be transferred to Pittsburgh as manager of the Pittsburgh territory.

THE AMERICAN ROLLING MILL COMPANY has organized a railroad division of its sales forces, with headquarters at the general offices at Middletown, Ohio, which will combine the handling of wrought-steel wheels, iron and steel sheets and various other products. Logan T. Johnston, recently assistant to the vice-president in charge of the commercial activities of the forged-steel wheel division, has been appointed manager of the railroad division and H. M. Arrick, who has

been connected with the sales department of the company, has been appointed assistant manager. C. G. Bacon has been appointed director of wheel research. Three district offices of the railroad division have been established in charge of W. B. Quail at New York, Ernest Baxter, who is also vice-president in charge of railroad sales of the Sheffield Steel Corporation, at Chicago, and F. E. Finley at St. Louis, Mo.

W. S. STEWART, formerly in charge of the Pacific Coast offices of the Lincoln Electric Company, Cleveland, Ohio, has been appointed district manager in charge of the Cleveland territory, with headquarters at the factory. Mr. Stewart is a graduate of Yale University. He subsequently spent a number of years in the factory of the Lincoln Electric Company studying arc welding, and later was transferred to the automatic arc welding department where he spent several years. He was then transferred to the sales department and assigned to the Pacific Coast.

LESTER N. SELIG, assistant to the president of the General American Tank Car Corporation and the General American Car Company, has been elected president of both companies to succeed Elias Mayer, resigned. Mr. Selig was born in Brooklyn, N. Y., on September 10, 1893, and graduated from the Brooklyn Law school. For a short time after graduation, he pursued the practice of law and in July, 1914, entered the employ of the General American Tank Car Corporation as a workman in its Warren, Ohio, shops. After holding various other positions, he was appointed assistant to the president.

Lester N. Selig

THE CENTRAL VALVE MANUFACTURING COMPANY has closed its sales office in the Railway Exchange building, Chicago, and is handling all sales from the factory offices located at 231 East Ninety-fifth street, Chicago, under the direction of C. S. Pope, vice-president. J. E. Brown, who was in charge of sales at the Railway Exchange office, has been transferred to New York and is representing the company in the eastern territory. The Chicago district sales will be handled by C. F. Pigott from the factory.

FREDERICK M. KREINER, who has been elected a vice-president of Manning, Maxwell & Moore, Inc., New York, retaining also his duties as secretary and treasurer, has been connected with that company since 1903. He has been secretary and treasurer since 1920. Prior to his association with Manning, Maxwell & Moore, Inc., Mr. Kreiner served for several years in the motive power department of the Pennsylvania. He is also a member of the New York bar, having been admitted in 1905.

Frederick M. Kreiner

S. L. POORMAN, representative in New England of the Westinghouse Air Brake Company has changed his headquarters from Boston to New York; John W. Henry, mechanical expert formerly at Washington, D. C., has been transferred to the eastern district, with headquarters at New York; C. O. DeWitt has been transferred from the engineering department in Wilmerding to the New York office as assistant to the district engineer; T. W. Baldwin has re-entered the employ of the company as mechanical expert at St. Paul, Minn., and D. R. Collins, formerly a locomotive engineman on the Denver & Salt Lake, has been appointed mechanical expert, with headquarters at Denver, Colo.

THE GENERAL WATER TREATMENT CORPORATION has been organized under Delaware laws as a holding company to merge the interests of the Permutit Company, New York, and the Ward-Love Pump Corporation, Chicago, both specialists in equipment for the softening and purification of water, as well as in allied chemical and mechanical lines. W. Spencer Robertson, president of The Permutit Company will be president of the corporation and Francis N. Bard, president of the Ward-Love Pump Corporation, will be chairman of the board of directors. Other board members will be: Vincent Bendix, Harry M. Durning, William M. Flook and Kenneth B. Schley.

Obituary

ADDISON H. BEALE, president of the A. M. Byers Company, Pittsburgh, Pa., died on Tuesday, October 28.

J. WILL JOHNSON, senior vice-president of the Pyle-National Company, died on the morning of October 2, as the result of injuries received in an automobile accident the previous evening.

FRANK BAACKES, vice-president of the American Steel & Wire Company, Chicago, died on October 18, following an illness of more than a year's duration.

FRANK M. HICKS, who in 1900 and 1901 engaged in the railway supply business in Chicago and who later was president of the Hicks Locomotive and Car Works, died in Cedarville, Ill., on October 12 at the age of 70 years.

GEORGE LEE MORTON, vice-president of the Galena Oil Corporation, died suddenly on the morning of October 19 in New York while on a business trip. Colonel Morton was a resident of Atlanta, Ga., and had been attending a business conference until the evening before his death. His death was due to a heart attack and occurred while he was seated in a chair conversing with one of his associates visiting him in his hotel room. Colonel Morton was born in Wilmington, N. C., on December 10, 1856. He received his early education at the Wilmington public schools and at Wilson Collegiate Institute, later earning his bachelor of arts degree at the University of North Carolina with the class of 1885. He engaged in the naval stores' business and about 37 years ago entered the service of the Galena-Signal Oil Company, now the Galena Oil Corporation, becoming vice-president of that organization in 1918. He was interested in public affairs having served in North Carolina, both as speaker of the house and president of the senate of that state. Later he was a member of the governor's staff and during the Spanish American War served as lieutenant in the United States Navy, commanding the U. S. S. Nantucket, the flagship of 26 coast defense vessels. Colonel Morton was well known by those identified with America's steam and electric transportation systems during the past quarter of a century. He took an active part in the development of trade associations in the steam and electric railway field, having been founder and several times president of the Southern and Southwestern Railway Club.

George L. Morton

Personal Mention

General

THE POSITION of mechanical engineer of the Los Angeles & Salt Lake at Los Angeles, occupied by H. C. Weaver, has been abolished.

D. J. WELCH, at one time road foreman of engines for the Baltimore & Ohio, has been appointed railroad smoke-abatement supervisor for Indianapolis, Ind.

WILLIAM NELSON, mechanical engineer of the Kansas City Southern at Pittsburg, Kan., has been appointed superintendent of machinery, with headquarters at Pittsburg, succeeding M. A. Hall,

William Nelson

deceased. Mr. Nelson was born at St. Paul, Minn., on March 28, 1882, and was educated in the public schools of that city and at the University of Minnesota where he secured his technical training. He began his railroad service on November 10, 1902, as a draftsman in the mechanical department of the Chicago, St. Paul, Minneapolis & Omaha at St. Paul, Minn. On November 1, 1905, he became lead draftsman for the Minneapolis, St. Paul & Sault Ste. Marie; on January 1, 1910, was promoted to the position of chief draftsman, and on September 1, 1917, appointed mechanical engineer. He became mechanical engineer of the Kansas City Southern at Pittsburg on January 10, 1922.

THE POSITION of mechanical engineer of the Oregon-Washington Railroad & Navigation Company at Portland, occupied by Clinton O. Mikle, has been abolished.

J. F. LONG, superintendent of motive power of the Los Angeles & Salt Lake, with headquarters at Los Angeles, Cal., has had his jurisdiction extended over the Oregon Short Line branch to Butte, Mont.

C. E. PECK, superintendent of motive power of the Oregon-Washington Railroad & Navigation Company with headquarters at Portland, Ore., has had his jurisdiction extended to include the Oregon Short Line between Huntingdon, Oregon and Green River, Wyo.

THE TITLES of the superintendents of motive power and machinery of the units of the Union Pacific System, J. W. Burnett, Union Pacific; J. W. Highleyman, Oregon Short Line; C. E. Peck, Oregon-Washington Railroad & Navigation Company, and J. F. Long, Los Angeles & Salt Lake, have been changed to assistant general superintendents of motive power and machinery with the same jurisdiction.

J. C. MENGEL, assistant to works manager of the Pennsylvania at Altoona, Pa. has retired. Mr. Mengel was born at Renovo, Pa., on February 14, 1864, and he became a machinist apprentice in the shops of the Pennsylvania at Renovo, Pa. on September 5, 1882. From January 1, 1887, to September 1, 1888, he served as a machinist, on the latter date being promoted to the position of assistant to the master mechanic. He was appointed master mechanic, with headquarters at Erie, Pa., on February 1, 1900; master mechanic at Elmira, N. Y., on June 1, 1906; master mechanic at Sunbury, Pa., on July 1, 1903; master mechanic at Baltimore, Md., on April 1, 1906, master mechanic at West Philadelphia, Pa., on April 1, 1907 and master mechanic at Altoona, Pa., on May 1, 1911. He was assigned to the position of assistant to works manager on May 1, 1927.

Master Mechanics and Road Foremen

C. H. HOLDREDGE has been appointed road foreman of engines of the Southern Pacific, Coast division, with headquarters at San Francisco.

C. E. BLOOM, general foreman of the Chicago, Burlington & Quincy, at La Crosse, Wis., has been appointed general foreman, with headquarters at St. Joseph, Mo.

A. B. WILSON, assistant master mechanic of the Southern Pacific at West Oakland, Cal., has been transferred to the Salt Lake division with headquarters at Sparks, Nev., succeeding J. J. Keller.

J. SHELABERGER, master mechanic of the San Joaquin division of the Southern Pacific, with headquarters at Bakersfield, Cal., has been transferred to the western division with headquarters at West Oakland, Cal., to succeed F. C. Keim, deceased.

H. CRANE, master mechanic of the Oregon Short Line at Pocatello, Idaho, has has his jurisdiction extended to include the jurisdiction exercised by W. H. Bressel and W. J. Ingling, master mechanics at Pocatello, and the latter two positions have been abolished.

J. J. KELLER, assistant master mechanic on the Salt Lake division of the Southern Pacific, at Sparks, Nev., has been promoted to the position of master mechanic of the San Joaquin division, with headquarters at Bakersfield, Cal., succeeding J. Shelaberger.

MARTIN L. CRAWFORD, assistant master mechanic of the Northern division of the St. Louis-San Francisco at Monett, Mo., has been appointed master mechanic of the Central division, with headquarters at Fort Smith, Ark. Mr. Crawford was born in October, 1881, at Waumandee, Wis. He served his apprenticeship in the shops of the Great Northern at Superior, Wis., after which he worked for various railroads until 1906 when he became a machinist in the employ of the St. Louis-San Francisco at Monett. He later served successively as assistant foreman and enginehouse foreman, being promoted to the position of general foreman, with headquarters at Fort Smith, in 1917. He was transferred to Monett as assistant master mechanic of the Northern division on July 1, 1928.

WILLIAM F. BRANDT, general foreman of the St. Louis-San Francisco at Springfield, Mo., has been promoted to the position of assistant master mechanic of the Northern division, with headquarters at Monett, Mo., succeeding M. L. Crawford. Mr. Brandt was born on November 10, 1887, at Springfield. He attended the public schools of that city and was first employed by the St. Louis-San Francisco as a boilermaker apprentice in April, 1904. A short time later he became a machinist apprentice and, upon the completion of his apprenticeship in 1912, was appointed assistant engineer of tests. He was transferred to Hugo, Okla., in September, 1913, as a machinist and in April, 1916, was promoted to the position of enginehouse foreman. He became general foreman at Hugo in April, 1918, and in April 1920, was transferred to Springfield as enginehouse foreman. In 1922 he was appointed general foreman at Springfield.

Car Department

C. A. HALLEEN, division general car foreman of the New York Central at Ashtabula, Ohio, has retired.

WILLIAM F. DOUGHERTY, car foreman of the Baltimore & Ohio at Locust Point, Ind., has been transferred to the position of car foreman at Bailey.

T. M. RAMSDELL, master car builder of the Oregon-Washington at Portland, has been granted a leave of absence because of illness and that position has been abolished.

R. B. KLEINFIELD, foreman of car repairs of the Newburg & South Shore has been promoted to master car builder with headquarters as before at Cleveland, Ohio.

Shops and Enginehouse

T. S. MADGE, locomotive foreman of the Canadian Pacific at Megantic, Que., has been appointed locomotive foreman, with headquarters at Farnham, Que.

J. MILLER, shop foreman of the Canadian Pacific at Glen Yard, has been appointed locomotive foreman, with headquarters at Megantic, Que.

GEORGE W. KELLY, master blacksmith of the Central of New Jersey at Elizabethport, N. J., retired on September 1 at the age of 73, after fifty years' service as a blacksmith. Mr. Kelly began his apprenticeship in the employ of the Pennsylvania at Altoona, Pa., in April, 1876, being promoted to the position of blacksmith in 1880. He was appointed a supervisor of the Chicago & North Western in

G. W. Kelly

1887, and from 1902 until his retirement he was in the employ of the Central of New Jersey as blacksmith supervisor. Mr. Kelly was one of the early presidents of the International Railroad Master Blacksmiths' Association.

Purchases and Stores

K. R. LUTZ, section storekeeper on the Chesapeake & Ohio at Stevens, Ky., has been promoted to storekeeper at Shelby, Ky.

C. J. IRWIN, division storekeeper on the Gulf, Colorado & Santa Fe at Temple, Tex., has been promoted to purchasing agent and storekeeper, with headquarters at Cleburne, Tex., succeeding E. S. Newton, deceased.

J. L. IRISH, general storekeeper on the Union Pacific System at Portland, Ore., has been transferred to Pocatello, Idaho, with jurisdiction extended to include the Oregon Short Line and the Los Angeles & Salt Lake, as well as the Oregon-Washington Railroad & Navigation Company.

Obituary

JOHN I. FERGUSON, who retired in 1927 as purchasing agent of the Indianapolis Union, with headquarters at Indianapolis, Ind., died recently in that city at the age of 75 years.

JOHN N. LANGAN, master mechanic of the New York Central at Kankakee, Ill., who died on August 26, began his railroad career in the enginehouse of the Indiana, Illinois & Iowa (now the Illinois division of the New York Central) at Streator, Ill. He subsequently served as a fireman and an engineman, in 1906 being promoted to the position of road foreman of engines. In 1928 he was appointed master mechanic of the Illinois division.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

CAMDEN FORGINGS.—The manufacture of Camden equalizers, drawbars and similar forgings is illustrated and described in detail in the new eight-page bulletin of the Camden Forge Company, Camden, N. J.

PIPE THREADING AND CUTTING MACHINES.—The salient features of the Landis 6-in. and 8-in. pipe threading and cutting machines are described and illustrated in Bulletin No. C-61 issued by the Landis Machine Company, Inc., Waynesboro, Pa.

ARBORS.—K & T arbors for milling machines are described and illustrated in a new 16-page catalog, No. 38, issued by the Kearney & Trecker Corporation, Milwaukee, Wis. Suggestions for the proper care of arbor equipment are also given.

ROTARY SHEARS.—The Quickwork Company, St. Marys, Ohio, has recently issued its catalog No. 90 describing the complete line of Quickwork rotary shears. The catalog contains the weights, dimensions, capacities and descriptions of all the Quickwork products.

ELECTRIC TOOLS.—The Standard Electrical Tool Company, Cincinnati, Ohio, is distributing a new 64-page catalog and price list No. 36. A number of new tools are featured and its complete line of electric drills, grinders, buffers and polishers described and illustrated.

HI-LO CRANE.—A four-page pamphlet published by the Whiting Corporation, Harvey, Ill., in which a complete description of the Whiting Hi-Lo crane is given. The features of the crane are high lift, low headroom, easy accessibility, roller bearings and an oil-tight gear case.

ANNITE.—A booklet has been published by the Quigley Company, Incorporated, 56 West 45th Street, New York, in which the uses of Annite, an active colloidal cleaning compound, are described. The product cleans without chemical action by emulsifying oils and grease and liberating the dirt.

ROLLER-BEARING UNITS.—Catalog No. 10, issued by the Shafer Bearing Corporation, 6501 West Grand avenue, Chicago, describes a wide range of stock mountings of Shafer roller bearings adaptable to machine and industrial applications. The Shafer self-alining principle is incorporated in these roller-bearing units.

RUBBER MATERIALS.—The Diamond Rubber Company, Inc., Akron, Ohio, has issued a new catalog of belting, packing, hose, matting and miscellaneous items. An interesting feature of the catalog is that the cover and mailing envelope have been printed from rubber engravings, hand-cut from sheet rubber manufactured by the Diamond company.

BILLET SHEARS.—Henry Pels & Co., Inc. 90 West street, New York, describes in its 12-page illustrated catalog, FV, its Big Billet shears which are built in twelve sizes ranging in capacities from 2½-in. to 9¼-in. round bars cold. The shears are built with guaranteed unbreakable steel plate frames.

WHITING EQUIPMENT.—A loose leaf bulletin entitled "Operation and Maintenance of Whiting Railroad Equipment" has been issued by the Whiting Corporation, Harvey, Ill. The data contained in this bulletin are intended to aid in the ordering of replacements and spare parts, as well as to aid in the proper maintenance of the machines.

THE CLEANING OF METAL.—Processes for the cleaning of metals and materials, with practical suggestions for their use, are described by Robert W. Mitchell, Ph.D., in a 76-page illustrated booklet issued by the Magnus Company, 420 Lexington avenue, New York. The treatise is in the nature of a handbook, being a general reference and guide to allied process problems.

NICKEL ALLOY STEEL FORGINGS.—This technical bulletin, No. 17, is a reprint of a paper by Charles McKnight presented before the semi-annual meeting of the American Society for Steel Treating which was held on February 7, 1930. It deals with the manufacture, uses, analyses, heat treatment and properties of nickel alloy steel forgings over 4 in. in diameter or the equivalent, and is illustrated with tables, charts and photographs.

BENDING MACHINES. — The Wallace Supplies Manufacturing Company, 1310 Diversey Parkway, Chicago, recently published a 32-page catalog in which is contained descriptions of its hand and power bending machines. Included are descriptions of machines for the cold bending of pipes, tubes, conduits, bars, rods, heavy wires, angles, channels, tees, flat materials, special sections and reinforcement bars.

BULLDOZERS.—A well illustrated and informative 20-page booklet, describing the complete line of bulldozers made by Williams, White & Co., Moline, Ill., has recently been printed and is being distributed by that company on request. The booklet opens with a page outlining a half-century of development from the first simple forming tool, built by Williams, White & Co. 50 years ago, to the present, sturdy, versatile and carefully-engineered machines available in 12 sizes, from the smallest No. 0, 1½-ton bulldozer, with 8-in. stroke and 24-in. die space, to the largest No. 30 machine, having a 36-in. stroke, 82-in. die space and weighing 75 tons. Succeeding pages in the booklet illustrate bulldozers for many uses in various industries, including the railroads. The booklet, which gives general specifications and the principal dimensions of all bulldozers manufactured by Williams, White & Co., will be of material assistance to prospective purchasers in selecting the size and type of machine best suited to their respective requirements.